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PROCEEDINGS OF THE TWENTIETH ANNUAL NATIONAL POTATO UTILIZATION CONFERENCE

Held July 29-31, 1970
Riverside, California

Agricultural Research Service
United States Department of Agriculture

THE TWENTIETH NATIONAL POTATO UTILIZATION CONFERENCE was held in conjunction with the 54th Annual Meeting of the Potato Association of America during the week of July 27, 1970, on the campus of the University of California at Riverside. The papers in these proceedings are those that were presented during the utilization conference July 30 and 31. Papers presented at the Association meeting July 27, 28, and 29 will appear in the American Potato Journal.

The material in these proceedings was provided by the speakers as written copy of the talks presented. The opinions expressed by the speakers at this conference are their own and do not necessarily represent the views of the U.S. Department of Agriculture. References, figures, and tables are reproduced essentially as they were supplied by the speakers. Underscored numbers in parentheses refer to references at the end of each paper. Mention of companies or commercial products does not imply recommendation or endorsement by the U.S. Department of Agriculture over others not mentioned.

Sponsors of this Conference were:

Potato Growers Association of California
United Fresh Fruit and Vegetable Association
University of California at Riverside
U.S. Department of Agriculture.

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TWENTIETH ANNUAL NATIONAL POTATO UTILIZATION CONFERENCE

The Twentieth National Potato Utilization Conference was opened by several brief messages of welcome. Dr. Mack Dugger, Jr. welcomed the conferees on behalf of the College of Biology and Agricultural Sciences of the University of California, Riverside. He spoke of the school's long interest in the problems of environment and of the increasing importance of agriculture in the world's food problems and their outstanding facilities for this work. Dr. Arthur I. Morgan, Jr. conveyed the regrets of Dr. Fred Senti of the Agricultural Research Service who was unable to attend this meeting because of his participation in the International Food Congress meeting in Washington, D. C. Dr. Morgan described the current missions of Agricultural Research Service as: (1) Reducing pollution from agricultural sources; (2) increasing returns from agricultural commodities; (3) protecting human health and safety; (4) feeding the hungry; and (5) reducing poverty. He said that our research program on potatoes would no longer be strictly one of utilization but would include nutrition and marketing as well as control of pollution in air, water, and land, resulting from potato processing.

WELCOME

Michael Shaw
Secretary, Potato Division
United Fresh Fruit and Vegetable Association
Washington, D. C.

This is a special conference for me (my second) and my first opportunity to welcome you on behalf of the United Fresh Fruit and Vegetable Association. As one of the sponsoring organizations of the Potato Utilization Conference we feel we have an obligation to those participating to keep them advised of our efforts in areas influencing this industry in which all of us are involved.

One of the key problems being tackled is one that has been often discussed over a period of many years but has yet to be effectively acted upon. The problem is that of tablestock consumption. At this point a bit of clarification is probably in order. We speak of increasing fresh potato consumption in terms of additional overall tonnage, not increasing fresh sales at the expense of reducing demand in processed potato items. We do not consider fresh potatoes as competing with processed potatoes because all are facets of the industry we represent. If we are to consider competition, it must be the "substitute" items so widely proliferating today. Tablestock is one factor in "balanced" utilization

By balanced utilization I refer to the share or mix that fresh potatoes represent. To better illustrate this I can cite an example from United's training programs directed toward conducting a profitable wholesale or retail operation. The concept used in the program is called balanced merchandising, but the principles have been used by all of us in other applications. In short, all the commodities are divided into five or six product groups. A yardstick is set up to indicate the percent of total movement represented by each product group in a healthy profit situation. When an individual group falls below the percentage we have set up as a guide, we concentrate our effort to build volume and maintain profit in that group. But we achieve the healthy balance by building the weak group, not by reducing relative volume in the other groups. This is why I stress the fact that movement of processed potato items is maintained while concentrated effort is focused on our weak group--tablestock potatoes.

The tablestock share of the mix has dwindled to about 50 percent of potatoes for food in the 1968 crop. The 1969 crop figures will undoubtedly swing the balance in favor of processing for the first time on record. Our work is quite clear.

What I will not do today is offer a slogan that points up the problem with no suggestion of a possible solution. We have lived with this deepening problem for over 20 years. Slogans have come and slogans have gone, while the problem has continued its unchecked downhill slide.

Studies on consumer preference have been made--in volume--in the late forties and early fifties. Paradoxically, preceding these studies--in about 1946--a "U.S. Consumer" potato grade was issued. That grade zeroed in more closely than any other on actual consumer demands. That grade is still on the books. That grade is still never used. Instead, the industry leans heavily on a U.S. No. 1 grade which with its broad latitude, lack of maximum size specification, application to all potato types, all seasons, and all producing areas has been largely responsible for many of today's problems. This is not necessarily a personal viewpoint. Many members have expressed dissatisfaction with existing grades. One thing is for certain: there will never be a set of grades to satisfy all shippers and all receivers. The existing grades have been around for more years than many of us in this room. They have gone through a dozen revisions. They still generate controversy in the industry and have only contributed to compounding the problem.

In lieu of a worthless slogan, we submit our plan:

Explore the possibility of establishing an entirely new set of U.S. potato grades based on types of potatoes--long white, round white, red and russet. Find specifications that would find general consumer acceptance and shippers could "live with" and profit by. Again, we are not looking for the impossible set of grades that would satisfy everyone in the industry. Anyway, the industry is progressing deeper and deeper into an era of specificity. Each individual producer has to decide what percentage of his crop, if any, is planned for the fresh market. This is not a Utopian goal. It is being done today. Many shippers and jobbers profit handsomely by careful, special, premium grading only.

Briefly, other highlights of our plan are:

(1) Explore cost reduction and quality control resulting from unit loading and palletization from shipping point to retail. Increased costs in heavy grading could be partially offset by reducing labor and product damage.

(2) Consumer education will be necessary to assure a greater possibility of success. Consumers will need to know what has been done, why it has been done and how they will benefit from it. Right now it is rare to find a consumer who doesn't think the U.S. No. 1 is the best grade available. Beyond that they know nothing. They don't know, for instance, if the U.S. No. 1 refers to quality, size, or anything else. They are convinced of the connotation of "number 1" and the best product, then are frequently disillusioned by what they feel are less than "number 1" contents.

(3) New consumer packs could help in several ways. They could carry the consumer education message, better protect the contents and lend themselves to in-store merchandising.

Summarizing, we know that others in the industry share our concern. We hope that many more will share in our efforts to "get the ball rolling." Your views, your support and your cooperation will be heartily welcomed.

LOOKING BACK AT 20 POTATO UTILIZATION CONFERENCES

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Twenty-two years have passed since representatives of the potato industry met at the first national utilization conference to review research, to consider problems of the potato industry, and to determine needed future research--all with the purpose of discovering and developing ways and means of expanding uses of potatoes. What has happened over that period of time when 19 such conferences were held, when we engaged in two undeclared wars, and when revolution occurred in supermarkets as well as on campuses? Have these conferences helped solve the numerous problems that always seem to be around?

Charles Dickens wrote an appropriate review for such a period over 100 years ago in his Tale of Two Cities: "It was the best of times, it was the worst of times; it was the age of wisdom, it was the age of foolishness; it was the epoch of belief, it was the epoch of incredulity; it was the season of Light, it was the season of Darkness; it was the spring of hope, it was the winter of despair; we had everything before us, we had nothing before us; we were all going direct to Heaven, we were all going direct the other way; in short, the period was so far like the present period, that some of its noisiest authorities insisted on its being received, for good or evil, in the superlative degree of comparison only."

Hardly anything is ever entirely right or wrong, good or bad, dark or light, or even up or down. We knew this before we read Dickens. It all depends upon where one is sitting--whether he is buying or selling, lending or borrowing, planning ahead or looking back, whether it's today or tomorrow, or whether or not one has any kids of his own. What appears to be good today can cause a crisis tomorrow, and what is bad today may bring about improvements in the future. But remember, when fate knocks you flat on your back, she leaves you looking up.

Most growers agree that the "best of times" occurred during the 1964 crop season when the average annual farm price for potatoes reached a high in modern times. We heard in Grand Forks in 1965 that the industry was amazed to learn how much an American housewife will pay for fresh potatoes. Prices at supermarkets rocketed to painful levels which must have made housewives think those were indeed the "worst of times." They were caught with no ready substitute for fresh potatoes in the usual ways of preparing meals and paid accordingly.

At another meeting in Seattle in January of 1970, a speaker said significantly: ". . .high prices because of cyclical shortages cannot be maintained by production control" (2). Bemis in 1952 told us why: "High prices . . . teach consumers to use substitutes" (5). Even though the potato industry may benefit in 1 year from high prices, excessive prices must not be continued in subsequent years, because consumers will turn to products such as rice and pasta for which costs may be lower and prices more stable.

Such a continuation is hardly possible--high prices inevitably promote greater plantings which in turn bring lower prices. Thus a good situation creates a bad one.

In the 1967 crop year, growers must have experienced the "worst of times" because of ". . .unprofitable prices to growers throughout the country" (31). Consumers, on the other hand, were pleased with retail prices more to their liking. Three years of increased plantings following the price bonanza of 1964 lowered the farm price to just over half of what it was in 1964. The decline in farm income from 1964 to 1967 was $280 million. Thus, in the single stroke of greater plantings, potato growers wiped out more income than processing accounted for in 1964, which I estimate to be less than $225 million. And let us not forget the blood, sweat, and tears that went into research, development, commercialization, and promotion to achieve that degree of processing in contrast to the relative ease of increasing or decreasing plantings.

The utilization conferences have been primarily concerned with research (mainly scientific), but the major problem facing the industry has been, and perhaps always will be, an economic one.

The problems of balancing potato supply to demand were discussed in many conferences. The extreme sensitivity of the balance point was highlighted by Wood in 1968 (31): "The potato industry has one of the highest rates of instability in both prices and income to growers to be found anywhere in agriculture. The year-to-year variation in prices. . .is 5 to 8 times greater than the price variation. . .for most field crops. This instability arises from two factors: The very highly inelastic demand for potatoes and the yearly variation in production. The demand elasticity for potatoes is about -0.20. This means that a one percent change in production causes about a 5 percent change in price, inversely." In other words, the more you grow, the less you get; and the less you grow, the more you get. But don't carry the scarcity idea too far, because of the threat of lower cost substitutes. Wood further said: "Consumers want about 110-112 pounds of potatoes per person per year regardless of the mix in which those potatoes are purchased." When supply varies from these quantities, prices react violently.

Sixty percent of the annual changes in production is the result of acreage changes, and 40 percent, of changes in yields. Thus, two-thirds of the wounds are self-inflicted. The other element, somewhat beyond our control, is variable yields per acre. Modern technology, however, has reduced this variability in numerous ways.

In order to make each year the "best of times" for both growers and consumers, instability of potato prices must be reduced. Wood discussed industry-managed production as one way. The increasing trend towards contracting should also have a stabilizing effect.

In 1962, Schaible (25) said ". . .processed potato products apparently now have an elastic demand and a reduction in price tends to boost sales." The processed market should, therefore, be better able to absorb varying quantities of product with less effect on prices. I haven't seen appropriate elasticity data for processed potatoes, but for apples, Grieg (1966) (6) showed that a 10 percent change in the price of applesauce results in a 44 percent change in quantities demanded, in contrast to an inelastic demand for fresh apples, much like potatoes. The trend towards processing as well as the trend towards contracting should, in the long run, add overall price stability to the potato industry. However, for the decreasing percentage of the crop sold as fresh, price instability could become even more acute.

The lesson we learned in the past 22 years and heard about in many conferences tells us that unless supply and demand of potatoes are properly balanced, the negative results that occur may undo all the positive results achievable from research. How this balance can be achieved apparently isn't known. For example, Wood said: ". . .the United States Department of Agriculture has issued marketing guides to provide a suggested level of production which is likely to result in a realistic price. . .[but]. . . On the average, growers have overplanted about 5 percent. . . [and]. . . in late-crop areas, the overplant has run about 8 percent per year" (31). According to price elasticity data, the resulting prices were 25 to 40 percent below what the recommended acreage would have brought. As Pogo said, "We have met the enemy and they are us."

The search for truths and the objective application of knowledge are the hallmark of an age of wisdom, but the resolution of problems by emotion or by default results in an age of foolishness. Twenty-two years of research has told us that blackspot is caused by impact; that high-sugar content causes browning in fried products and that it can be eliminated; that mechanical injury in harvest and handling is a major problem; that separation of potatoes by specific gravity is a useful means to assure uniform quality for intended use; that the housewife is not satisfied with the quality of fresh potatoes usually available in the market; that greater production brings lower total returns as well as a lower unit price; that the consumer puts quality and convenience above price within a reasonable range; that processing can use the proper variety and kind of raw material for the intended product and to that extent has minimized the problem of raw material selection and conditioning for many customers; and many other invaluable truths about the potato and how better to grow, store, process, and distribute it. A good deal of wisdom was demonstrated in the research to attack waste and pollution where it is created instead of waiting until the residues and effluents pile up in bins, ponds, and even waterways. A product of this research, dry caustic peeling, promises to avoid at least three-quarters of the waste load of a potato processing plant.

But it is the age of foolishness when blackspot remains a major problem in fresh potatoes, when some restaurants and drive-ins continue to sell french fries and chips that are excessively brown; when if specific gravity grading is so promising, so few potatoes are so graded; when in the development of new potato varieties, "Practically everything that has been done in so-called improvement of the potato has either neglected cooking quality or resulted in lowering the cooking quality. . . We have done a pretty good job of dressing up that part of the potato which, in most cases, goes into the garbage. . .but little has been done to improve the edible portion" (27); when a proper balancing of potato supply with demand is an event of chance and not design; and when expediency is often a stronger force than application of knowledge. "Still unanswered, for thousands of customers, is the question, 'How can I be sure of getting potatoes that will cook well and taste good?'" (5). That question asked in 1952 had no sure answers at any of the subsequent conferences.

One might be philosophical about the industry's obligation to provide humanity with an abundant supply of low-cost potatoes. One speaker at the 1951 conference said: ". . .potato supply and demand can never be accurately balanced; to have enough, we must be sure to grow a few too many" (4). If one believes his obligation is to provide enough, the statement cannot be contested. But how much too many? Only 1 percent too much brings nearly 5 percent less return. Why accept such a penalty? Most growers, shippers, processors, and distributors are in the business to make money not to prove their stoicism. In light of the price inelasticity of fresh potatoes, this dictum, sounding more like foolishness than wisdom, is sure to cause great pain.

Nowhere was the epoch of belief more in evidence than in the industry-wide commitment to potatoes as a nutritious, low-cost, non-fattening food. The most outspoken and eloquent proponent was the late Col. Paul Logan who in 1952 said, "It is the most important vegetable crop in the world . . .and will one day become man's most important foodstuff. The facility and abundance of its production over wide areas of the earth, together with its high nutritive value, makes the white potato of supreme importance in any program to provide a satisfactory minimum diet in areas of food insufficiency throughout the world" (17), and in 1948 ". . .it is a fundamental food, abundant in quantity, economical in use, and excellent in nutrition" (15).

At the 1957 Conference, Kueneman cited other qualities, ". . .potatoes are, without a doubt, one of the most wonderful 'keepers' that Mother Nature has endowed us with in the vegetable field. . . They have become an accepted foodstuff of every race who has become exposed to them. . ." (13).

There was almost universal belief that potato processing would expand. Just how and to what extent were the only questionable points. Schaible in 1962 said, "Recent trends indicate that by 1970 the total volume of potatoes processed for food will be at least 60 percent larger than in 1961. Other factors, such as new product innovations, could open the door to even greater expansion. . . An even greater potential [for processed potatoes] exists in the retail market, which in terms of volume is roughly four times larger than the institutional market" (25). After 8 years we can now see that volume processed more than doubled, but new product innovations accounted for a very small proportion of the gain, and the institutional market still maintains its dominance in the use of most potato products. This chain of events must have been surprising to other analysts too, for in 1961 we heard that: "Much of the growth in processed potatoes. . .has been accounted for by the institutional trade. . . The mass feeding operations have found it profitable through saving labor to switch to processed forms of potatoes, but this switch of the 'institutional' trade is about saturated. Growth from here on must come from the consumer market, not from the institutional market." And then he added a further basis for incredulity by saying, ". . .indications are that any major continued growth [in processing] in the Pacific Northwest will be in Idaho. This growth will be restricted by the ability of food technologists to develop additional dehydrated products that will have greater consumer acceptability" (30).

Many consumers believe that potatoes are high in calories, a factor often cited as contributing to the long slide in per capita consumption. To refute this belief, the potato industry has published data showing that a medium-sized baked potato has only 90 calories, whereas the other common foods listed have more. But isn't it interesting that the reversal of the downward trend in per capita consumption has been attributed to the great growth of processed potato products, and the product that has grown the most is frozen french fries? Next in growth has been potato chips.

Each 90 calories of potato solids contained in french fries has accompanying them from 50 to 80 calories of fat, and for potato chips the fat value is 155 calories. The vegetable shortening industry should be most pleased at the upturn in per capita consumption of low-calorie potatoes.

What disagreement have we observed among those who were brave enough to stick their necks out? As a starter, how can the downward trend in per capita consumption of potatoes be stopped? Here was a suggestion in 1951. "We have agreed that we can't expand seed outlets; that the chip industry is handling its expansion nicely; that industrial uses are a salvage operation that should be expanded only for surplus low grades and culls. That leaves fresh potatoes for food the big outlet to work on" (21).

At the first conference in 1948, a speaker said, ". . .the development of new food uses for potatoes. . .is a logical means of counterbalancing the decline in consumption. A new commodity must. . .provide a new appetite or taste appeal" (7). And the next year we heard that: "The most fruitful research would lie in the field of improving existing products, rather than in the development of new products, which would be subject to the hazards of lack of interest and sales resistance on the part of the public" (23). History, I believe, is on the side of the latter, growth has been in potato products long known to the American consumer. The change to processed potatoes has been in a shift of preparation from the kitchen to the factory.

The 1949 Conference produced another look into the crystal ball which may have been made with more hope than promise. "All in all, the nonfood utilization of potatoes offers the greatest challenge, and quite possibly, the greatest opportunity for increased potato utilization" (26). Today this statement may be as true as it was 21 years ago, but the challenge may well be greater than the opportunity.

Is blackspot related to cell turgor? If you've attended all these conferences, especially the one in 1964, you won't be sure. "Blackspot susceptibility decreases with time, following harvest with cell turgor held constant, indicating that susceptibility is probably independent of cell turgor" (10). But on the other hand, ". . .blackspot is a reversible condition and. . .it is in some way associated with turgor pressure of cells within the tuber" (14). We do know, we think, that impact should be avoided. We can certainly agree even today with a statement made in 1958 about internal blackspot: "There is much that we don't know about this disorder" (18).

Just how unsure we are of what we know was highlighted in the conference in 1967 when a group of researchers reported on color in potato chips in 11 pages of single-spaced typing containing 24 supporting tables. "It was not the intent of the authors to draw any final conclusions from the data presented in this paper. We consider it as only a progress report. It is planned to publish in greater detail later when tentative conclusions are confirmed" (22). That may take 24 pages and 50 tables.

Potato processing has had its effect on growing areas, but which ones are affected the most, the spring and summer or the fall States? In 1962, we heard ". . .there will always be a market for good-quality spring and summer potatoes which, at this stage of our technology, do not lend themselves most readily to dehydration processing, for example. As another observation, some fall State areas could be more adversely affected by shifts to processed potatoes" (11). But fall States, don't despair, you had your champion in 1959: "Processed potato products offer strong competition with the early, nonstorage potatoes where usually production and marketing costs are higher. A significant increase in competition from dehydrated and frozen potato products will make some of these early producing areas less attractive" (8). This opinion was backed by another speaker in 1961 who said, ". . .California producers know that sharp increases in consumption of processed potatoes could drastically and adversely affect the present seasonal advantage in the early fresh potato deal. . .the long-run prospect is clear. California must find ways to process potatoes or the early operation is likely to shrink seriously. . . There are four or five years of grace" (20). That was said 9 years ago, so the period of grace must obviously be extended, or we should start now with a late count. The California late spring crop in 1969 was 98-1/2 percent of the 1950-59 average.

A recent article in the Packer gives evidence that this may be a "season of light" in which research findings on gravity grading are being applied in fact. Potato Service, Inc., of Maine announced that its processing supply contract provides that ". . .a bonus of 10 cents a barrel would be paid for potatoes reaching specific gravity of 1.080 and higher, and 10 cents a barrel for potatoes frying in the first four color groups and 29 cents a barrel for potatoes in the first three groups" (1). At 10 cents a barrel, the light is dim, but at least, it is on.

Research reveals much light, but admittedly there is a dark side. For each bit of new information discovered, too often it comes with the realization that the problem is even more complex than originally believed and that there is much more to learn. The German philosopher Goethe expressed this problem: "We know accurately only when we know little; with knowledge, doubt increases." The darkness looms ever greater when we find that many problems have no easy answer and may be with us for a long, long time. We whittle away at the corners, ever hoping for the big breakthrough that will make the entire problem disappear. In spite of many years of research into the basic nature of the potato, we heard at most conferences that "unk-unks"[1/] are still around. We could wish they were instead "Shmoos."

In 1949, it was stated, "Texture. . .is a quality factor most open to research, and there is a crying need for an objective evaluation. . . Flavor. . .a means of objective measurement is needed here also. . . There is a definite relationship between reducing sugars and specific gravity, but the need exists for more precise evaluation" (12).

In 1964, the problem was restated: "With the expansion of processing, more and more attention is being focused on constituents of the potato. What elements contribute to texture, color, taste, and general acceptance of the finished product, all of which constitute quality?" (32). And 5 years later we hear: ". . .many of the problems in potato processing directly relate to tuber anatomy and within-tuber variations in composition. This applies not only to the more obvious relationships between structure and texture. . .but also to other compositional variables such as distribution of sugars, phenolics, amino acids, and enzymes. Research devoted to understanding all of these variations could lead to a more successful application of results if the detailed structural variations within potatoes were given greater attention" (24). More and more, but obviously still not enough research.

The need to predict cooking behavior of potatoes has been discussed in virtually every conference including the first one. There were differences, however, in how it was said. In 1948, it was: "We need more information about the physical characteristics of potatoes as related to cooking quality" (15), and in 1949, "It is increasingly apparent that successful potato distribution in the future will be

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[1/] "Unk-unks are the 'unknown-unknowns' or unanticipated problems that crop up during the research and development and even production phases of so many advanced weapons systems." (From the National Observer, May 25, 1970).

on the basis of a good definition of what the potato will do and a guarantee that it is good for that purpose" (16).

In 1969, the problem sounded like this: "Despite a tremendous volume of research relating composition and other variables to quality, no completely satisfactory procedure has been developed for predicting at digging time the performance of potatoes following subsequent storage and handling" (9).

Other troubles persist: "The problem of getting the potatoes from the farmer to the consumer with the least loss of quality is one of the biggest headaches of the entire potato industry. . . In summary it can be said. . .that handling is the most important factor in the maintenance of quality during shipping and handling" (28). That was the message in 1951. Fifteen years later, we heard it again: "Cutting, nicking, bruising, air checking due to mechanical harvesting, and massive storage all damage potatoes. . . Mechanical injury to potatoes is still the No. 1 problem. . ." (19).

At the very last conference in 1969 we heard a panel of housewives expressing their dissatisfaction with the quality of potatoes available in fresh form (29):

"I think my problem is the variance of size in one bag."

"My chief complaint is, how come every bag you buy has to have at least one rotten potatoe in it--at least one, it's got to."

"I don't think they keep as long as they did years ago."

"A bad potato in a bag, that's about the smelliest! When you buy them by the bag, you can't look them over."

"And another complaint I have, I don't think potatoes taste as good as they used to. . .sometimes you get a good batch and at other times they are green and they just taste funny."

"One thing I do object to is finding a black, rotten potato in the middle of a bag of about ten."

". . .you always get at least one, or sometimes four or five, rotten potatoes. . .and that makes me mad. . . I take them right back to the store. The man at the store hates me."

My secretary says, "Amen" to the above comments.

In processing research, the light has been brighter, application more widespread, and results very significant.

At the first conference, Bemis said, "The laboratory must develop new or improved ways of transforming potatoes into useful products," and ". . .the Potato Advisory Committee. . .has repeatedly stressed that in research top priority be given to projects for expanding uses _other than as human food in fresh form_" (_3_). Cited earlier were two other speakers who said that new and improved products were needed to increase potato consumption.

Kueneman said at the second conference: "The drop in potato consumption indicates that this important food is getting too little attention. The trend toward processed foods, perhaps largely because of their convenience factors, has not been adequately met with processed potato products. Year-long availability of raw potatoes may be one cause" (_12_). But cause and effect have now changed places. The cause for lack of processing has now become the factor that makes the great upsurge in processing possible--year-around availability.

A change or shift in the reasons for processing has occurred in the American food scene. Initially, perishable fruits and vegetables were processed to preserve them for consumption in off-season. Potatoes did not need to be processed for that purpose. But now convenience has become the big thing. Recent growth in processing has been largely in convenience foods, and processed potatoes are a prime example. To illustrate how complete has been the shift in the justification for processing is this statement from the 1962 Conference: "In order to be able to process potatoes economically, they must be available in fresh form the year around." This means they must be harvested continuously throughout the year, as in California and other early areas for such products as chips, or be available from long-term storage as in the late States.

If the need for year-around availability was true in 1962, then it must still be true today. Might we then question whether large early crops, such as California's late spring crop, can ever be economically processed, other than as current supplies for chips or as filler for late State processing areas in the Pacific Northwest?

The successes of dehydrated potato flakes and granules, the frozen potato products, and the improved storage and shipping practices have large measures of research developed technology in their makeup. For processing to grow, as it has, to use over 40 percent of the food potatoes, is evidence that there has been significant progress towards the goals of the conference set out 22 years ago--". . .of discovering and developing ways and means of expanding uses of potatoes."

But the road has been made rocky by problems, and it is not entirely smooth even now. How much progress has research made in solving those problems? Five problem areas seem to me to have towered above others in discussions at the conferences:

1. Decline in per capita potato consumption,

2. Mechanical injury to potatoes,

3. Difficulty of balancing supply to demand,

4. Increasing pollution from processing plants, and

5. Lack of consumer satisfaction with fresh potatoes.

For these five problems, the score appears to be 2 wins and 3 losses for a batting average of .400.

New products are credited with arresting the downward trend in consumption, so here was a winner in solving that problem. Unfortunately, however, growers found that there is no positive correlation between prosperity and per capita consumption. For example, in the 1951-55 period when per capita was at its lowest levels averaging 107 pounds, farm price averaged $2.22 per cwt. During 1966-68 (after nearly 15 years of creeping inflation) per capita consumption rose to 112 pounds but average farm price fell to $2.00. There is nothing sacred about per capita consumption; in fact, it is in reality per capita disposition--getting rid of what is produced. In that light, it would be easy to increase per capita consumption, just grow more; but at what a sacrifice in farm price. We should stop looking at the per capita figure and concentrate on prices, returns, and profits, all of which have been better at low per capita consumption.

Mechanical injury remains a major problem, perhaps increasing in severity with the trend towards mechanical harvest. The average bag of potatoes still contains potatoes damaged by mechanical injury. If not a loss, certainly not yet a win.

Growers continue to wrestle with the problem of balancing supply to demand. Research has given us many indications of the consequences of oversupply and shortages, but the solution involves more than economic analysis. Wood said, "Some form of industry-managed production seems essential for the successful continuation of this industry" (31). Not a winner yet.

With the development of the dry-caustic peeling method for potatoes, a long stride has been made in reducing the waste and pollution problems of processing. Modification of processes in the plant to avoid the generation of wastes and minimizing water usage offer the most practical and least costly means of handling the problem. One of the two sure winners.

The testimony given last year by the panel of housewives about the quality of potatoes available in stores indicates this problem has not been solved. So far, this is still a loser.

The past 22 years was a period of change and varying response. Because history has a habit of repeating itself, we can expect the next 20 conferences to be held in a continuing period of change.

We are not yet ready to ascend to heaven, and only a few cultists are making plans to go the other way. We have much before us, but it will be less than the best if the major problems of the past continue to plague us in the future. Hope springs eternal that no new problems will appear to cause more darkness and long winters of despair. We don't really want the next period to be like the past or present. It's got to be better. It must be anticipated in the superlative as the "most."

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LOOKING AHEAD

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The potato business is a highly diversified business but its foundation is a simple one--the customer--someone who buys, pays for, and uses potatoes. Making sure this happens in an orderly way is what potato marketing is all about. It's a frustrating business today! Transportation from field to market has become a nightmare. A day of telephoning to railroads trying to locate, expedite, or divert a car of potatoes can lead to ulcers. You phone to divert a car--the voice on the other end says, "Wait till I get a pencil, - wait there's a pad here somewhere." Then, next day when you follow up - you hear about "the computers." Trucking lines are no better. The Hunts' Point Railroad Terminal in New York is chaos. Four or five days will pass without one car of potatoes arriving, then 23 come in all at once. You can't have orderly marketing under these conditions. A great many of the RS (refrigerated) cars on the tracks don't work. Mechanically refrigerated cars are good but there aren't enough of them and the demurrage can kill you. A customer receiving 20 cars at one time at $25 a day demurrage has $500 cost. The railroads don't want refrigerated car business. New and better cars are reported to be coming soon but they're not available now. If something happens to refrigeration enroute, the railroad refuses to honor claims.

Palletization and containerization are good ideas but have not yet been worked out. Who will own the containers and pallets, how do they get back to the shipper? Who determines the uniform size? Who pays the freight on the weight of the pallet?

Loading and unloading cars has become a real headache. Heavy loads in mechanicals will necessitate stopover cars or put a small man out of the potato business. The 100-pound bag is on its way out. The help is unable to handle them! A sad commentary on motivation and physical fitness of this generation. The new container will probably be a box of perhaps 50 pounds. But then incinerator laws make disposing of unusable boxes a big headache.

Customers continually complain about a rotten potato in a bag. Packers don't put rotten potatoes in bags. Our distribution system has not reached perfection and never will. A bag of potatoes must survive rough handling, weather, bugs, disease. We are our own worst enemies.

Our society runs on food. Almost no one raises his own food today or drives out to the farm to get it. Wholesale food markets are just as essential to the life of a city as its sewage, water, and power systems. Who is going to take over this hard, frustrating job of wholesale fruit and vegetable distribution? Young people today are not interested in a career as food broker or distributor. The food industry knows it has problems and is working hard and intelligently to solve them. We are probably the most self-critical of all American industry.

One good aspect of today's younger generation from the view point of the potato industry is their love of french fries and potato chips.

Farm labor costs are going up rapidly while consumers complain prices are too high now. Marketing potatoes includes a long list of problems in transportation, display, packaging, human error, ad infinitum.

Other farm groups have their problems too with the FDA, FTC, and FWOC. In a period of inflated costs for transportation, packaging, equipment, labor, and so forth, Florida citrus sold for its lowest price in 5 years.

Produce-dispatchers are getting tired. They are helpless in today's market. They know bruising causes defects and blackspot but they see every day the careless way potatoes are handled in the terminal markets, in the chainstores, in unloading trucks. Surely someone must care.

New innovations in grading and sorting are vital. Sorting and grading by people just isn't working. What is going to happen with the entry of large corporations, such as oil companies in the farming business. I can tell you - the small farmers will be squeezed out.

In conclusion, the public, the government, the schools - everyone must realize the importance of orderly and profitable food distribution in today's society. The social unrest of the past 5 years may be nothing compared with the trouble people will make who cannot get food because the food distribution system has broken down.

PROCESSED POTATOES: FROM THE FORTIES

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"Processed Potatoes: From the Forties"--a very broad subject range for a Potato Utilization Conference, even the 20th. It covers a period of 30 years or so of continuing dramatic growth, starting from limited beginnings, to a major position in the vegetable processing field; an exciting field then and even more so now.

It is impossible to give enough credit to the role played by these utilization conferences in the dramatic growth of the potato processing industry. They have provided an "oasis" for exchange of ideas, information, stimulated thinking, and solution of problems that I am sure has helped everyone, whatever his role in this field. The continuing sense of helpfulness and understanding has always been cultivated in these meetings, and I hope it will ever more be so.

Since my title does not specify which forties, I can take the liberty to go as far back as I choose; and I choose to go back to the 1500's and throw in a little review. Like Clyde Rasmussen, I can look back across the utilization meetings, which I did, and found many repetitions, each one affording a better foothold for understanding of a problem investigated many times, but yielding to new tools and approaches. Yet, these new findings result in conclusions that only open the doors for new attacks. One might say of the potato, that the only constant is change.

Everyone likes to refer back to the Conquistadores of Spain and the remarkable civilization they found in South America in the 1550's. I am sure we have all heard and read about Chuño, a foodstuff the Inca's used to implement the logistic problems of their widespread empires. They used many of our processing steps: cooking, drying, freezing, and grinding. What is more, the product is still made in those areas, so it must have been right for the marketplace. So, if we find repetition of subject matter in our conferences over the years, we have some precedent for it.

At the risk of some repetition, from other talks, I would like to carry on with a brief résumé of the potato: The first mention we find of potatoes coming into Europe is through the records left by the Monk, Hieroymas Cordan, who mentions that potatoes were placed on Spanish ships returning to Spain, in ballast, and that they were very useful as a foodstuff. However, when these potatoes arrived in Spain, the clergymen warned the populace that these were heathen vegetables not mentioned in the Bible; and it took a lot of convincing to bring about the use of potatoes in Europe.

Frenchmen planted them in botanical gardens and regarded them as a curiosity, and refused to put them on the table. However, little by little, farmers recognized potatoes as a good food. They spread to England, then to Ireland, and to much of Europe.

There are a number of interesting points in history where we find mention of the use of potaotes. Frederick, The Great, promoted potatoes as a food for his peasants and issued an edict that he would "cut off the nose of any peasant not raising the required acreage."

The War of the Bavarian Succession in 1778, entitled, "The Kartoffelkreig," was a war between the Germans and Austrians. The final battle, which was decisive, was over stores of potatoes located in farmers' fields.

Antoine Parmentier campaigned for the acceptance of potatoes as a food in France. He enlisted the aid of Marie Antoinette, who wore blossoms in her hair; and due to her influence, the court chefs created court dishes. As a result, the potato began to get greater acceptance as a food in France. It was calculated at this time that a single acre of potatoes could support a family of six to eight, and a cow, for a year. So you can see, it was a very important crop indeed, and a valuable contribution from the New World.

Potatoes became a field crop in Ireland some time before 1660 and were popular with the Irish farmers because they protected against the loss of other foods--they would store well in the ground and would survive the rains. Lady Montgomery, who had extensive farms in County Downs, Ireland, in the 1760's provided land for her people to raise potatoes for food, and flax for clothing. By 1780, it was reckoned in Ireland that a 280-pound barrel would provide a week's supply of food for a family, at the rate of five to eight pounds per head per day, served three times a day. As a result of this almost enforced diet, our present potato became known as the "Irish" potato. This nomenclature, of course, was reinforced by the great potato blight in 1848, when the crop failed and over half the Irish population immigrated to the United States.

In 1719, potatoes were introduced into the Colonies at Londonderry, N. H., which was an Irish colony. Some of the farmers there thought the potatoes were bad; some, good. By 1740, they had pretty generally spread throughout the Colonies.

In the past, wars have provided a dramatic stimulant to potato usage. The Boer War, for example, brought about "Edward's Precooked Potato Shreds," a product that had a limited commercial market in England after its military usage was finished. It was apparently used by some explorers. It remained more or less on the market for many, many years.

World War I brought an impetus to the production of dehydrated potatoes which led to some interesting developments, but no real foothold in the marketplace after the military demands were over. Certainly, by the beginning of World War II there was an overwhelming need for research, knowhow, and can-do, in the dehydrated potato field.

Paralleling these developments, other processed uses for potatoes developed. Man learned how to recover starch and use it for industrial purposes and food. He learned how to make palatable alcoholic beverages, popular in many parts of the world. Potato flour became an important food ingredient. Canned potatoes have had a down-and-up-production history. From the time the first "Saratoga Chip" was consumed, potato chips have been a part of the American diet. In the past 10 years, they have been growing in popularity all over Europe. They are probably the "model" for the snack trade and will continue to be so. There have been many attempts to emulate their tremendous quality. Those of us engaged in other forms of potato processing have a great deal to be thankful to those in the potato chip field, in research and usage and in farm and industry practice. Many of the needs, requirements and reactions of the potato chip industry have been common denominators to the other processed forms of the potato. An important part of the potato utilization meetings have been keynoted by people associated with the potato chip. Perhaps there has been some cross fertilization as well.

World War II really turned on potato research. The Allied Combined Food Board, USDA, Quartermasters, British Ministry of Food, and Cambridge Low Temperature Research Station, universities, as well as other groups, jumped in headfirst and produced results, as a great many who have had to do with these meetings can attest, as they have been a part of it. I have always felt that these meetings have been pleasant and rewarding continuations of that impetus.

In one way or another, some phase of almost every subject we have discussed in the 20 meetings was at least touched on in the preliminary research era. Breakthroughs have been many; and we are still trying to break through the breakthroughs with new approaches. There is such a long road ahead and every so often it seems as though it is necessary to "reinvent the wheel," when we look at some of the results.

From the forties on, we have all worked on many problems associated with potato processing; and as I reviewed the files for this meeting, I was struck with the similarity of the then and now. Before World War II, there were eight to 10 plants engaged in the dehydration of vegetables, including potatoes, in the United States. In full bloom, there were some 300; the majority, potato dehydrators. This dropped back to about 10 plants immediately after the war. From this nucleus, our present dehydrated and frozen potato industry grew. Along with this growth, the problems did not go away--changed perhaps, but only by degree.

The role of the regional laboratories in the developing processed potato industry has been dramatic, in terms of the work undertaken and the results obtained. In addition, through their leadership in bringing together the utilization conferences, they have not only served as a cohesive force to our group, but certainly have acted as stimulants and catalysts. There can be no question of the value to our industry of this devoted group.

During the war years, a great deal of useful information was developed that had to do with product performance of dehydrated potatoes, particularly with factors involving the influence of blanching on the enzyme systems of the potatoes, handling techniques, and many other related processing factors. However, the first real breakthrough probably was the appreciation of the limited shelf life of the products produced, and the lack of acceptability in the field by the G.I., as a result of shelf life failure. Comprehensive studies were undertaken on the factors affecting shelf life and useful contributions were made in terms of sulfur dioxide (SO_2) applications, moisture levels, and various other aspects of the Maillard reaction, which was certainly one of the most guilty culprits. Some of this early work led to the realization that low moisture content of the finished product in itself was not the complete answer in retarding deterioration because the resultant browning products of the Maillard reaction masked other defects of flavor. The offshoot of this work led to studies in the oxidation of some of the fatty compounds of the potato, which, in many cases, were more objectionable than the end product of browning.

Through the years, the use of chromatography and other tools to study the various aspects of oxidative rancidity have led to tremendous advances in our understanding of the role of antioxidants and in processing techniques to minimize rancidity.

One of the most useful early tools that was put to work in the processing industry was the relationship of specific gravity and total solids to potato texture. Additional work is needed in the field of plant breeding and biochemistry to narrow these ranges and produce a more uniform raw product. The careful work of many laboratory workers in the changes of the starch, sugar, and protein chemistry in storage need greater relationship back to the original factors in developing improved varieties.

We have had a number of important mechanical aids made available in processing techniques: The use of the new infrared dry peel process is one of the most recent and promising of these ideas. Potato processing has always been a culprit as far as pollution by-products are concerned. Lt now appears this breakthrough is going to go a long way toward cutting down the pollution load.

Practically everyone in the potato processing industry, or in any way related to it, is certainly aware of the many problems in the treatment of potato-processing wastes. It is gratifying that as much progress has been made in this field; and I am sure much of this work is going to be useful to processors of other foodstuffs as well. It was a problem met head on by the industry; and with the combined attack of all the skills and research tools from all sources, a great deal of progress has been made. Much of the basic work that has been carried on in the past and is continuing today, will have a dramatic influence on the recovery of usable materials that in the past have been wasted, and will assist in the overall ecological balance of the potato and nature.

In October 1948, the second annual meeting of this group took place in Albany, Calif. I was assigned to discuss some research problems confronting the potato processors. A few abstracts from that talk, I feel, are in order. I quote:

> Processed items seldom equal fresh products in quality, but with proper raw materials and the best methods they can equal the fresh products usually available on the market...
>
> The processor's main problem is to make a single quality product from raw materials having all the quality variations that occur before the potatoes reach him. He therefore is faced with all of the problems of the fresh vegetable industry as well as the actual processing problems. Some important quality factors are:
>
> 1. Color: Some variations, such as geographic, can be controlled by selection. Preferences for snowy white or creamy yellow must be considered. The processor cannot tolerate darkening on cooking, a problem as yet unsolved.

2. Size: This often limits the possible processing, as texture and peeling problems occur. Small sizes are used in canning whole new potatoes to gain good heat penetration and to withstand processing temperatures. Still the product is often greatly changed. Recent work shows that milder processing may be adequate, and hence a more desirable raw material may be used.

3. Texture: This frequently correlates with size. It is a quality factor most open to research, and there is a crying need for an objective evaluation. Most processed foods fail by lack of texture retention. Tools are needed for rapid evaluation of selection processes like gravity grading.

4. Flavor: A means of objective measurement is needed here also. A knowledge of national or regional preferences would be helpful.

Freezing opens up the cell structure of potatoes without materially altering the finished product. This permits development of frozen potatoes for frying purposes like hashed brown. Frozen french-fried potatoes are a leading item. The Simplot Company has worked five years with these, and governs their handling by accumulated storage-life data.

Freezing of low-cost materials such as potatoes is often avoided, but comparative costs of commercial preparation of fresh products are poorly evaluated. The processed material will, however, compete on a convenience basis with other processed foods. Some frozen potato products will have a lower cost than frozen corn or peas. Taking advantage of newer processing techniques will further help control costs.

Reducing sugar content affects yield, rate of processing and quality of product, for the sugar is changed in the treatment. In dehydration, material with 1 to 3 percent of reducing sugars can be dried in one-third the time required for material with a 3 to 5 percent content. Also the quality of the former is preferable because there is less degradation. There is a definite relation between reducing sugars the specific gravity, but the need exists for more precise evaluation. Basic research along such lines might well be done in the Regional Laboratories. Examples of problems

> are: Why do some fresh potatoes give much lumpiness when mashed, and how can sorting raw potatoes avoid the trouble? Similarly, how can erratic fat absorption in French-frying be reduced? Again, why do some potatoes go to pieces when boiled?
>
> Breeding programs should include the development of good cooking quality. Much basic information is needed about starch and its gel and paste characteristics.

One can understand from not only the subject matter I covered, but those points that were raised by others at this early conference that there was a great deal of work to be done; and by reviewing the proceedings of the many conferences we have held, we discover that a great deal has been done. The most concrete evidence is the continued growth of many of the frozen potato products which have come onto the market and taken such a dramatic place in our frozen food industry. I will just quote a few industry figures:

In 1953, frozen potato products were reported as being 70.7 million pounds. At that time, we felt that the growth was fantastic. By 1960, the industry was producing 551.4 million pounds; by 1964, it had reached 1.1 billion pounds; in 1966, almost 1.5 billion pounds; and in 1969, over 2 billion pounds. All factors of the growth of this industry point to this trend continuing; and I am sure other potato products are continuing to grow in perhaps not as dramatic a fashion as the frozen potato products, but certainly the industry appears to be keeping apace with the DuPont Computer Projections made several years ago. Meetings such as this are part of the pacemaker activity of this growth.

PROBLEMS IN RETAIL MARKETING OF POTATOES

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It is for me a distinct honor to be asked to participate in this, the 20th National Potato Utilization Conference. We have heard and will hear from many experts in their respective fields, reviewing the latest developments in the marketing, production, processing, and other facets of the vast and complex potato industry. As a representative of Safeway Stores, Incorporated, I would like to touch briefly on some of the problems in the retail marketing of potatoes.

You will notice that I said some of the problems as there are many and they are as varied as there are areas of production, varieties of potatoes, and marketing concepts. What was true last year in the retail marketing of potatoes may not be true this year or next. We are entering the decade of the scientific seventies, a changing era in which whole new concepts in marketing will become a reality, whether we are talking about potatoes in the FRESH form, PROCESSED potato products as we know them today, or potatoes in some YET UNDEFINED form which our affluent society may demand. We, today, are living on the brink of the greatest era of change in the 5,000 year written history of man. We are stepping from an era where most of the answers were known to one in which none of the answers are known, and the only limit on human thought is something we cannot begin to define.

As we discuss the problems in the retail marketing of potatoes, we must realize that at the beginning of the 20th century approximately 40 percent of the U.S. population lived in urban areas. By 1968, 80 percent of our population of 200 million plus lived in cities. By the year 2000, it is estimated that 90 percent of our population of 300 plus millions will be urban dwellers. It is toward the wishes and desires of these people that we must direct our marketing concepts for potatoes in whatever form desired. Our society today and during the scientific seventies will be of a much younger average age, with different sets of values, tastes and eating habits than the average consumer of the forties, fifties, and sixties.

All of our marketing efforts--whether it be FRESH potatoes, PROCESSED potatoes in their many forms, or potatoes in forms not yet developed--must be through the combined efforts of all segments of the potato industry. This means all the way along the line from the horticulturist who develops new varieties and strains of potatoes through the producer, the packer or processor, the retailer, to the ultimate consumer.

In line with this, we encourage the potato industry to develop an organization which would actively support and work with producers, processors, farm organization boards, and commissions, as well as with agribusiness. This new organization could help to develop new markets and expand existing markets for potatoes and potato products. It could also work with government agencies and retail organizations in helping to develop, on a large scale, general policies, grade standards, transportation methods, distribution facilities, and the dissemination of marketing information.

To succeed in the scientific seventies, we will need to promote potatoes as a commodity, not as a variety or an area of production. Promotion must be continuous and be consumer oriented instead of product oriented. Consumer wants must be satisfied.

If there is a consumer revolution in this country, and I believe you will all agree that there is, it is in part a revolution of rising expectations and demands. The expectation of a high-quality standard has become a CONSUMER RIGHT.

Looking at the problems in retail marketing of potatoes in this light, we can only say the problems are many and varied. It will take the combined efforts of all facets of the industry to solve them as well as other problems within the potato industry.

From a retail standpoint, potatoes represent approximately 22 percent of the total tonnage sold in the FRESH produce departments of retail stores in the United States and approximately 24½ percent in Canada. From this, you can see that potatoes and potato quality are a very important factor to today's retailer. Today's consumers demand more convenience in the foods they buy; they demand higher quality.

This has led to a gradual decline in the amount of potatoes marketed in the FRESH form and an increase in the consumption of FROZEN and PROCESSED potatoes and potato products. With the processors now utilizing better than 50 percent of the potatoes grown, there has been a tendency on the part of growers to gear their farming practices to increased tonnage or yield-per-acre, at the expense of quality. This has been reflected even more drastically with the advent of mechanical harvesting, with contract crews who in many instances are more interested in the number of acres harvested per day than in the way the potatoes are handled. It has led to excessive amounts of mechanical damage to the tubers which, while it may be a minor problem to the processors, becomes a major problem in retailing fresh potatoes. As the cost-price squeeze tightens, this mechanical damage could also become a major factor to the processor.

We believe it is time for all to pause and reflect on how we can offer tomorrow's customer a better product whether it be in FRESH or PROCESSED form. We need to encourage growers to grow a better product; to harvest and handle the potato tuber like the fragile commodity it is. If the scientific minds of the produce industry can develop machines to successfully harvest tomatoes for the fresh market, then it would seem logical that as large as the potato industry is, it should be able to accomplish the same objective. It cannot, however, be done by individuals or individual companies. It will have to be done through a concerted industry effort.

We, as retailers, believe that it would be beneficial to the potato industry all the way from the grower to the consumer if grade specifications on potatoes were tightened. It does not make sense that up to 14 pounds of unmarketable potatoes can be included in each 100-pound sack of fresh potatoes and still make U.S. No. 1 grade. With the cost of transportation increasing almost daily and the cost of eight fingers and two thumbs at retail, it is not practical to transport or handle tubers that are not marketable. If this expensive procedure could be eliminated and the retailer receive all marketable tubers, the growers would gain in the long run through better returns for his product and increased consumer demand.

In a world of interdependence, America's farm problems must be solved with an eye to the farm problems throughout the world. Consumers must be considered and a clearer picture of the meaning and importance of any farm program must be communicated to the rank and file of American consumers. With the many diversified uses to which the potato tuber can be directed, it does not make sense to try to market any but the best quality potatoes in fresh market channels. Unfortunately, many growers, packers and shippers do not follow this marketing concept; they continue to pack and ship marginal quality. This is especially true in consumer packs where, in many instances, there are from 34 to 40 individual tubers in a 10-pound bag of potatoes. This means they average about 4 to 4½ ounces each. Many shippers use tinted bags to further hide the defects that may be evident on the tubers in consumer units. Such practices do not build consumer confidence in potatoes as a basic food. The fresh potato industry's inability or unwillingness in the past to give the consumer what he or she wants from a quality and size standpoint has been one of the factors that has caused the decline in consumption of fresh potatoes.

The consumer's desire for, and willingness to pay for convenience has been another factor in the declining consumption of fresh potatoes and the increased consumption of potatoes in their various processed and frozen forms.

As an industry, potato people must plan ahead to keep a delicate balance between the sale of potatoes in fresh and processed forms. When this balance is lost in either direction, our marketing process as an industry becomes bogged down in its own quagmire of oversupply and decreased consumption. The loser then becomes the grower or producer who can no longer market his crops on an equitable basis.

The retailer faces other problems in the marketing of potatoes. During the start of fresh harvest season, the retailer's shrinkage on potatoes can be extremely heavy due to discoloration, greening, shrivel, and so forth. These conditions could be materially changed by more stringent maturity regulations, by improved handling methods, improved transportation, and improved packaging.

Tests have proved that potatoes can be transported in bulk form from origin to destination with far less mechanical damage than when shipped in 100-pound burlap bags, 50-pound burlap bags, or 5- or 10-pound consumer units. This is true even though the consumer units may be packed in master containers.

It, therefore, seems strange that there is a reluctance on the part of the potato industry as a whole to swing to bulk shipments in either rail cars or trucks. In fact, in some areas, it has been unlawful to make bulk shipments.

As a retailer who operates centralized packaging operations at distribution center level, we feel it is time for the potato industry to ask itself: 1. How do they want to buy potatoes? 2. What varieties and sizes do they want to buy? 3. Why must they have specific quality and grades? 4. When can the necessary changes be made? 5. Where will our ultimate consumers live? Since our total marketing function is to serve people, we must ask ourselves these questions regarding the future approach to merchandising potatoes, regardless of whether they are FRESH, FROZEN, or PROCESSED. We can no longer afford to go in several different directions at the same time, depending on whether we are interested in fresh potatoes, processed potatoes, or frozen potatoes. The demand for frozen and processed potatoes is growing and will continue to grow as Mrs. Consumer demands more and more convenience. The demand for FRESH potatoes can grow instead of decline if we in the various phases of the potato business give Mrs. Housewife what she wants instead of what we want her to have.

Today's consumer makes 90 percent of her buying decisions by eye, not by knowledge. It is therefore up to us to offer her products that have eye appeal as well as taste appeal. As one variety of potato fades out and loses its basic quality characteristics and appearance, other varieties must be developed as replacements. Varieties that have the appeal that today's consumer demands.

There was a time in the retail business when a potato was a potato and the customer took whatever variety, size, or shape that might be available at that time in the area where she lived. This is not true today. Today's retailer must carry a wide variety of potatoes in a wide range of sizes and packs to fill the desires of all customers: RED potatoes, WHITE potatoes, ROUND potatoes, LONG potatoes, BAKING potatoes, BOILING potatoes, NEW potatoes, OLD potatoes. Before long, it will be: PEELED potatoes, OVEN-READY potatoes; yes, possibly SLICED and DICED potatoes--all FRESH, not frozen or processed.

If you say, this man is a dreamer, I would have to say you are right. But, without dreamers, would we have made the industrial and agricultural progress we have since the turn of the century? Imagination - dreams and America's aggressiveness have brought us where we are today and will take us where we dream tomorrow.

One of the retailer's greatest problems is prices that fluctuate like a yo-yo at the end of a string. We can visualize the day in the not too distant future when prices for fruits and vegetables will be established to cover longer periods of time, not on a day-to-day basis or at the whim of some buyer or salesman. It is not inconceivable that prices could be established for the entire season, allowing a profit for the grower and retailer as well as a value for the customer.

It has been said, and rightly so, that all endeavor, no matter how large or how small, is made up of three essential parts: PEOPLE, COMMUNICATIONS, and TEAMWORK. Without these components, all effort would be wasted and forward progress impossible. Taking these three components into consideration, the retailer of potatoes faces the seven MISCHIEVOUS MISSES:

1) Miss information
2) Miss quotation
3) Miss representation
4) Miss interpretation
5) Miss construction
6) Miss conception
7) Miss understanding

All are due to PEOPLE, COMMUNICATION, and TEAMWORK.

In summary, we can say some of the problems in the retail marketing of potatoes can be attributed to: present quality and grade standards; present maturity standards; current harvesting and handling practices; packaging materials and methods; present transportation methods; a lack of common goals and direction by all facets of the potato industry; a lack of communication between grower, shipper, processor, retailer, and consumer; our combined blindness to consumerism and how it affects today's marketing patterns.

Everyone of us is part of a great marketing force that should seek to serve the needs of the American producer and consumer. We must strive to inform and educate the consumer as well as the producer to better utilize the knowledge systems we now have. We must strive to reduce the waste and nonproductive inefficiencies that increase costs to the producer and the consumer. In closing, let me quote from William G. Fern:

> When someone stops buying,
>   Someone stops selling.
> When someone stops selling,
>   Someone stops making.
> When someone stops making,
>   Someone stops working.
> When someone stops working,
>   Someone stops earning.
> When someone stops earning,
>   Someone stops buying.

THE CONSUMER REVOLT

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You may wonder what the consumer revolt has to do with the potato industry. And I can hear some of you asking what the revolting consumers think they're doing... trying to run the food industry? You may have already decided the whole subject of consumerism is already drowning in a sea of words, or being beaten to death at the tip of overactive tongues...that you hope sooner or later (preferably sooner) consumerism will quietly go away.

First of all, consumers aren't trying to run the food industry. They're trying to go about their business of buying food for families...the food industry keeps getting in the way. Don't think even for one second that consumerism is going to go away. As the young thinkers under thirty say...no way! Let me bring you up to date on some of the latest happenings in the world of the consumer.

A Federal-State Relations Office has been set up within the President's Committee on Consumer Interests... its purpose is to encourage formation of strong consumer protection offices, to encourage formulation of effective consumer laws at the State level, and to advise State offices of significant developments in the consumer area; Consumer Protection Committees have been or are being organized in most of the major cities; businesses sponsor special forums in an effort to improve communications with consumers; recently, members of the Federal Trade Commission supported consumers' rights to take part in Commission hearings; and the Commission is hiring a team of consumer protection specialists to educate and inform consumers.

All of this emphasizes the importance of consumers. The little old lady in tennis shoes is wearing cleats these days and consumerism is here to stay.

Your thought processes can be at a pretty low performance level and still reach the conclusion that consumers are convinced that the food industry hasn't been and won't listen to them...politicians will. As members of the food industry, you surely realize that consumers have become angry and disillusioned with you. Never before have they been so cynical toward, as well as critical and suspicious of, food and food supplies. The concerns fall into five general divisions:

- Consumers are suspicious of food advertising claims...claims that products possess some super special nutritional content.
- Consumers are suspicious of production practices...that pesticides and herbicides are present in fresh products in quantities beyond safe limits.
- Consumers are suspicious of processing practices...that processing removes valuable nutrients and no effort is made to restore them.
- Consumers are suspicious of food additives... that unneeded ones are added to enhance or increase natural food nutrients in quantities that are beyond safe limits.
- Consumers are suspicious of food prices...not necessarily that they are too high, although this is the way the suspicion is usually stated. Suspicion arises from the fact that consumers have no reasonable way of establishing price comparisons between food in different processed forms.

Now just who is this consumer who harbors all these suspicions? I'm sure you've been treated to a mini-skirted sketch of the average consumer, but let's take one more look. I call her the Mythical, Typical Misunderstood Food Shopper.

If you can believe anything you read, see, or hear, the typical food shopper is about 25 years old, has a couple of children, makes a lousy cup of coffee, and her brain matches her mini skirt. She's happily married to an absolute dolt who still somehow manages to make about $15,000 per year.

Don't laugh. I read the other day that producers and processors of food products, along with their ad men, have finally discovered that consumers are women just like _their_ wives.

Anyway, it _is_ true that half the population is under 25. But _surely_ you don't believe all of them are married! In truth, young marrieds make up about 7 percent of the population and account for about 8 percent of the spending. So what? Well, if half the population is under 25 that automatically makes the other half over 25, and _they_ account for a major part of the spending. Nor are all the consumers married to dolts or otherwise. There are some 11 million widowed or divorced women in the country, and that translates into 1 out of every 5 households being headed by a woman.

Our typical consumer isn't a mini brain either. She's better educated than mother, grandmother, or great grandmother, and she puts increasing emphasis on continuing her education after she's away from formal schooling. She considers planning meals and shopping for them as serious business and she is more interested than ever before in learning to be a better food shopper. She learns from her neighbors, newspapers, and magazines. Many newspapers now carry full budget columns in their food pages. Magazines, in case you missed it, have graduated food-buying articles into the cover story class. Nor are food-buying articles confined to newspapers and women's magazines, you find them in news and financial magazines, too.

In recent issues of Changing Times, there was one article devoted exclusively to budgeting...at three differend income levels; a later article set forth 62 ways to save money and a dozen of them were directly related to food buying.

One of the greatest difficulties the food shopper has is price comparisons...and their relationship to nutrition, not that she intends to buy the least expensive food available. She actually rates price fourth...behind quality, nutrition, and family preferences. But she feels she has the right to be able to compare prices...and I agree. The problem, as it confronts her, is with the highly processed but desirable convenience items. One homemaker put it this way, "One package of instant potatoes weighs 5 ounces and makes 8 half-cup servings; another weighs 6 ounces and makes 8 half-cup servings. I can compare prices on the basis of number of servings, but don't you suppose there's a difference in nutritional value?"

That is just one illustration...some days are full of them...illustrating that homemakers really are interested in the amount of nutrition their money buys. But maybe consumers' concern for nutrition has escaped you completely.

Time was when people ate fresh potatoes in sufficient amounts to make an important contribution to the vitamin C content of diets. Those days are gone...probably forever. The latest Food Consumption Survey of the United States Department of Agriculture unearthed the information that vitamins C and A are two of the nutrients more frequently below what's needed in people's diets. In an effort to help correct this, the USDA has started fortifying dehydrated potato flakes with the two vitamins, A and C, for distribution to needy families. Inadequate diets aren't limited to needy families. For those consumers who aren't so needy but happen to like processed potato products and want full nutritional value, fortifying some of them may be an important consideration for your industry. Wouldn't it indicate your interest and concern for replacing nutrients lost in processing?

Consumers, as you know from sales figures, generally accept processed potato products although they are critical of specific products and specific brands. They are critical of hash browns and french fries that won't brown. They are critical of hash browns that shrink up to nothing. They note that some brands of french fries are too greasy or take up too much fat while browning. They complain about french fries that are darkened. They don't understand why...when potato products vary so much in quality...there aren't grades to use as guides.

They tell me that some of the convenience products really aren't.

> Frozen whole potatoes take longer to cook than fresh ones, and furthermore, there are too many different sizes in the bag, so that when some of the potatoes are cooked, the others aren't yet.

They have much the same complaint about frozen vegetables for stew...by the time the carrots are cooked, the potatoes are mushy. I've used both the frozen whole potatoes and the stew vegetables, the consumers are right.

Consumers still use fresh potatoes although not so many as they once did, and in the future they may use fewer. Not only are fresh potatoes giving way to processed products, but rice and macaroni products are increasing in use as well. Per capita use of rice and macaroni combined doesn't even come near per capita use of potatoes, but their advantages show in the products that have been developed. They are often used in specialty dishes...particularly rice. A whole family of one-dish meals and casseroles with rice or macaroni products as the base have mushroomed in the past few years. Some of these products are already prepared and frozen, some of them come as complete meals in a container, for the homemaker to put together. Rice and macaroni have the advantage of being enriched, fortified, modified, or restored with nutrients lost in processing.

The people who use these prepared rice and macaroni dishes have the same general characteristics as those who use prepared potato products. They are over 30, relatively well educated, and are in the middle-to-high-income bracket. It looks as if some hotter competition is building. What do consumers have to say about fresh potatoes? They worry a lot. They worry about the green on potatoes and still are irritated that a 10-pound bag of U.S. No. 1's has potatoes of so many different sizes, and that they can expect to find at least five obviously damaged ones in the bag. Is it any wonder that when consumers exchange information, they advise each other to buy from a bulk potato display whenever possible?

As one homemaker said, "I know U.S. No. 1 potatoes isn't the top grade...I know several different sizes are allowed, and that damaged ones are allowed too, What makes me mad is...they are all like that. The minimum standard is the only standard. Isn't anyone proud enough of his product to make it better than all the others?"

Consumers appreciate the fact that more potatoes come to market labeled by use. But a shopper for potatoes pointed out this situation the other day: One market regularly offers two different 10-pound packs of U.S. No. 1 potatoes. One pack is simply labeled "utility", the other is labeled "use for baking, boiling, or frying"...it sells for 10¢ per bag more than the utility. Her question was this..."What else do you do with potatoes besides bake, boil, or fry them?...Doesn't that mean they're utility potatoes... good for any use? Apparently it costs an extra 10¢ just to get the words on the bag!"

Another point consumers bring up regularly, not just about potatoes and potato products, but about all products, and that includes potatoes. Consumers wonder if you ever go into food markets and buy your own and your competitors' products right out of the counter, as food shoppers do. Do you really know how your product compares with others in the market situation...not in sales figures, but in quality?

Where is all this talk leading? To emphasize one more time that consumers are highly suspicious and critical of all phases of the food industry. You've been so busy lifting consumers into the ranks of the best-fed people in the world, with the most varied, high-quality, year-round diet at the lowest possible cost that you lost sight of a couple of facts. The abundance, the multiplicity of choices, and the change from a producing to a consuming society have driven you farther and farther from the consumer. This has created misunderstanding, suspicion, and cynicism about your methods of operation and the resulting products. To put it in modern vernacular...your credibility gap has widened to a chasm.

Yours isn't the only industry with a credibility gap, of course. A colleague of mine quotes a survey out of Chicago which asked the question, "Who do you believe most?"... then listed several professions. Politicians, believe it or not, scored 42 percent on the believability polls. Food retailers scored 11 percent, but they weren't last. Advertising men came up with a whopping 1 percent. Even they weren't last. Nobody, but nobody, believes used-car salesmen; they scored a big fat zero.

What can you do about your credibility chasm? Considering that ad men scored only 1 percent on that believability poll, you might take a good look and listen to your publicity. Is it really saying what it should be saying? Just the other day some publicity on fresh potatoes crossed my desk. The blurb said potatoes are good...I can find no argument with that. It stated that potatoes contain vitamin C...I can't quarrel with that. But then, it went on to state that potatoes contain riboflavin, thiamine, enzymes, pectins, potassium, calcium, iodine, phosphorus, manganese, and protein. The protein, stated the publicity, is virtually complete. Now, everything said about the potato is the truth. But, with the exception of vitamin C, everything else is present in such small amounts that its contribution to an adequate diet is slight. And why, in this lengthy list of nutrients, was carbohydrate omitted? This unfortunate combination of truth, omission, and ignorance put the entire piece of probably costly publicity into the realm of the misleading. It even lost the credible point it should have made...that fresh potatoes are a relatively good source of vitamin C and an important food in normal diets every day.

Another quarrel I have with publicity...this is about processed potato products...is the lack of real information. When instant potatoes were first put into cans, the publicity... 16 lines of it, not counting a couple of recipes...didn't make it clear what form the potatoes were in. I thought for a time they were already whipped, but since that didn't make any sense, I decided they weren't. Nor could I decide whether they were flakes, buds, or granules. You can bet that, since I couldn't decide, I wasn't about to use the publicity in any of my food marketing news columns or newsletters.

Most homemakers like to collect recipes. And that's exactly what they do...collect them. Most homemakers like to read recipes, many homemakers collect them, but only about half ever use them. And today's homemaker-in-a-hurry won't ever use long ones. I can't report this as a valid statistic, but I suspect that if a recipe calls for more than five ingredients and if assembling it takes more than five minutes and involves more than three steps, homemakers may read and collect the recipe, but never use it. Incidentally, the two recipes included with the instant-whipped potatoes in a can were 20 and 13 lines long.

You can say this is nit-picking...that I cite only two examples. Would you believe that in the past year, I have received only two pieces of potato publicity from your industry? That doesn't count market reports, but they are in no way written for consumers. They are written for you.

If you intend to do anything about the credibility chasm, try to close it, not widen it further. I know people who judge the state of our entire economy on the price of fresh potatoes.

Consumers are interested in the size of the potato crop...how much of it is intended for fresh use...and what the effect on prices is likely to be. When the price of potatoes changes, up or down, many of them suspect that someone could have told them. If they get any information, it is likely to be the scary kind that sounds like a vague threat, and then, when they can't figure out what it means...they ignore it.

Somehow, some way, you have to get back to talking to consumers. You have to see your business from the consumer's viewpoint. Maybe you need a home economist in your marketing department. I know some of you have home economists in your consumer service departments, or you employ home economists to do your publicity, but these gals only get the facts from your point of view. You need someone with the consumer's point of view to see the products and check the facts and publicity before they go wrong.

Many business concerns have set up consumer panels or hold consumer forums...the younger age group calls them Rap Sessions. At these sessions, the consumers do the talking... business people listen. They not only listen, they hear! I'm sure that some of you attended the Potato Utilization Conference in Michigan last year and heard the consumer dialogue panel. It was rated as a highly successful panel and I'm sure you heard some pointers on potatoes you hadn't been aware of, or that you didn't know consumers were aware of. Maybe that's what the potato industry needs...a consumer education specialist.

To date, the potato industry has not been singled out as BAD GUYS, but you may be considered guilty by association with Bad Guys. Surely, trends in consumer legislation emphasize the need for a bridge over the credibility chasm. If you continue with only a little publicity, you're almost certain to get a wider chasm. If you avoid or omit the truth, you're likely to get more legislation. If you set out to do a real job of consumer information and education, you are sure to get the business...good potato business.

FDA LOOKS AT THE POTATO INDUSTRY

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There may not be a food industry that touches as many bases with the FDA as the potato industry, first, as a raw agricultural commodity, and then as the processed product, usually frozen. Witness: pesticides, food additives; bacteriological; general sanitation, including moldy or otherwise unfit; color additives, seed treatment and fair packaging and labeling.

Let us consider a few of the above. Preventing microbiological contamination is one of the most important food programs in FDA and has real application to frozen processed potato products. Three parts of one section of the act[1] specifically cover the microbiological basis for considering a food adulterated. These are as follows:

Section 402 (a) (1) states, in part, that a food is adulterated "if it bears or contains any poisonous or deleterious substance which may render it injurious to health." The presence in food of specific infectious bacteria such as salmonella or toxins of staphylococci and *Cl botulinum* is considered adulteration under this provision of the act. No other supporting evidence is needed. These organisms or toxins needless to say, can have serious harmful effect to man and may even result in death.

Section 402(a)(3) of the act states that a food is adulterated "if it consists in whole or in part of any filthy, putrid, or decomposed substance or if it is otherwise unfit for food." It is under this provision that a food may be adulterated with filth if it contains *Escherichia coli*, excessive coliform bacteria, or excessive numbers of bacteria in general. If our inspection of a frozen potato products processor discloses conditions that could account for the above bacteria such as the presence of rodents, houseflies, cockroaches,absence of hand-sanitizing solutions, absence of equipment sanitization, poor employee practices, or lack of production controls to prevent time-temperature abuses, we can then allege the finished product is adulterated within the meaning of Section 402(a)(3).

This brings us to a third pertinent part of the section of the act covering adulterated food. Section 402(a)(4) states that a food is adulterated "if it has been prepared, packed, or held under insanitary conditions where it may* have become contaminated with filth or whereby it may* have been rendered injurious to health." Thus, establishment inspection evidence alone showing insanitary practices may constitute basis for legal action. In other words, it is not necessary that we confirm, in the finished product, the presence of pathogenic bacteria or those bacteria whose presence indicate insanitary conditions.

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[1] Federal Food, Drug and Cosmetic Act of 1938.

The sanitary aspect of processed potato products handling encompasses the broad field of food plant sanitation and includes not only conditions that lead to contamination of food with microorganisms or other elements dangerous to health, but other objectionable extraneous materials as well, including filth, that have no place in food. Sanitation as it relates to safe and wholesome foods is considered inseparable from microbiological health hazards. The consumer has the right to protection against practices violating hygienic decency. Often the line of demarcation between a harmful and filthy food is exceedingly narrow. But since many of the sources of extraneous materials, or in the language of the law "filth," in food products are potential sources of disease organisms, they carry implications of danger to health although the specific agents of disease may be difficult or impossible to demonstrate. The use of unfit raw materials or failure to provide for the elimination of filthy or decomposed raw materials not infrequently leads to violations of 402(a)(3), and may contribute to insanitary conditions in violation of Section 402(a)(4).

Obviously, the microbial content of food can be a significant factor in determining its acceptability, legalistically or otherwise. Generally, the FDA uses the combined result of product analysis and establishment inspection as a means of determining whether or not a product is adulterated within the meaning of the law.

Specific microbial administrative guidelines often are used to guide administrative personnel responsible for reaching regulatory decisions as to whether or not legal action is warranted. Such guidelines specify microbial levels that must not be exceeded; in some instances, these limits apply only when coupled with factory inspection showing substantial insanitary conditions. One microbiological guideline specifies mold fragment limits in potato chips. Other guidelines specify count levels singly or in combination, depending on the product, for coliforms, *Escherichia coli*, *Staphylococcus aureus*, and total viable bacteria for the following frozen processed potato products: baked, stuffed, patties, and hash browns. Numerous other guidelines exist concerning decomosition, various forms of filth, and other extraneous materials.

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*Emphasis added.

The use of microbiological criteria for foods by the FDA is not new, nor is it likely to decline. Studies directed toward the development of microbiological criteria for foods are continuing.

There has been considerable recent publicity concerning mercury pollution in fish and water in at least 20 States. Mercury pollution is not exclusively an industrial problem of chemical and paper manufacture--about 6 million pounds yearly or about 17 percent of all mercury used in this country is used in agriculture as seed treatment for the prevention of fungus growth after planting. Mercury is toxic, cumulative, and persistent. It destroys brain and nerve cells. It effects chrosomes, so it can affect heredity. There are no legal tolerances or exemptions from the requirement of a tolerance for mercurial fungicides in any foods or feeds. We are striving to perfect methodology which will consistently and accurately detect mercury at a level of 0.01 p.p.m. Even at these levels, however, I would like to emphasize that our scientists regard mercury as having definite pharmacological significance to the consumer.

Early in October 1967, a food plant at Anaheim, Calif., reported to the California Department of Agriculture that some of the potatoes delivered to them for processing were in burlap bags stenciled "Poison." Sampling and analysis by the State revealed mercury up to 30 p.p.m. on the bags and 2 p.p.m. on the potatoes. The State advised our office and our sampling and analysis confirmed the presence of mercury. The State supervised the destruction of the lot consisting of approximately 300 100-lb. bags.

Investigation by FDA revealed the packer or shipper dipped bagged seed potatoes in 4 parts per thousand mercuric chloride solution prior to the cutting and planting of the seed pieces. The empty bags were returned to the packer or shipper in the fall by the growers. These bags were then used by the firm to pack out U.S. No. 1 and processing grade potatoes.

We, at the Los Angeles District, collected samples from the three succeeding shipments made by the same firm and seizure resulted. Each of the three shipments consisted of 500 bags U.S. No. 1 potatoes. Average analytical findings were as follows: Car A, 587 p.p.m. mercury on the bagging, 3.4 p.p.m. mercury on the peel, and 0.18 p.p.m. calculated on the whole potato basis. Car B, 742 p.p.m. mercury on the bagging, 5.6 p.p.m. on the peel, and 1.1 p.p.m. mercury calculated on the whole potato basis. Car C, 1,550 p.p.m.

mercury on the bagging, 5.0 p.p.m. on the peel, and 0.89 p.p.m. calculated on the whole potato basis.

At the time we informed the shipper of our analytical results, the firm had, in transit, a car of 500 bags "B" grade potatoes and decided to divert the car back themselves. Upon its return, it was sampled by FDA, and the entire lot was voluntarily buried by the shipper.

Our investigation continued to the remaining potato growing areas in Oregon, Idaho, and Washington and revealed use of mercury dip only in one area by two firms. Only the referenced shipper was packing potatoes in reused bags supplied by growers.

By the 1930's, can coatings had improved to the extent that many more products were being canned. Freezing also came into its own, and it was recognized that more preparation of food in the factory kitchen would result in less in the home kitchen, and the day of so-called convenience foods had arrived. The trend towards shipment of foodstuffs over longer distances stimulated the search for improved processes and new chemical aids for the agriculture and food industries.

Some of the new chemicals were used with very little testing to determine their effect on man. The burden was on the FDA to find an additive harmful after it was on the market. Many products containing monochloracetic acid were removed from the market because of the toxicity of that chemical. We found one producer of frozen sliced peaches adding Thiourea to his pack in order to retard discoloration. Thiourea has very undesirable effects on warm-blooded animals. This packer's stock of frozen peaches was destroyed before it reached the market.

The late Dr. Paul B. Dunbar, then Commissioner of Foods and Drugs, concluded that the existing procedure offered a very clear danger to health. He discussed the situation with interested Congressmen. As a result, a Select Committee To Investigate Chemicals in Foods was established with Congressman James J. Delaney as chairman. Two major recommendations of that Committee led to the enactment of the Pesticide Chemicals Amendment in 1954, and the Food Additives Amendment to the act in 1958.

Some of the first formal tolerances were for pesticides. DDT was declared safe at a level of 7 p.p.m. on many crops. In recent years it has been demonstrated that some plants and animals accumulate DDT and pass the higher concentrations along the biological chain. This was demonstrated dramatically by the accumulation and concentration that led to high levels of the pesticide in coho salmon from Lake Michigan. We found as much as 30 p.p.m. of DDT and its analogues in the fish, and some of the salmon had to be seized a little over a year ago.

A Commission on Pesticides and Their Relationship to Environmental Health was established a year ago last April under the chairmanship of Dr. Emil Mrak.

The Commission's recommendation that most uses of DDT be phased out within 2 years achieved the greatest news coverage, but the Commission also proposed that when pesticides first come on the market, they might be subjected to an initial provisional approval and their effects further evaluated on the basis of limited commercial utilization before they are given final approval. It was also recommended that all pesticides should be subjected to periodic review to determine whether the terms of the initial approval should be altered.

Food additives, other than pesticides, also have come in for their share of attention recently. Cyclamates that were generally recognized as safe (GRAS) have been found upon further testing to cause bladder tumors in mice, and the Secretary ordered them out of foodstuffs in accordance with the Delaney clause in the act.

The Congress defined a food additive as a substance that "is not generally recognized, among experts qualified by scientific training and experience to evaluate its safety, as having been adequately shown through scientific procedures to be safe under the conditions of its intended use."

Soon after the Food Additives Amendment was enacted, our scientists developed a list of substances which we knew were widely employed in food manufacturing and which we thought might be entitled to the designation "generally recognized as safe" (GRAS). We published the list in the Federal Register as a proposal. We also mailed out copies of the proposed GRAS list to about 900 knowledgeable scientists, soliciting their comments. In accordance with their response, some of the items were dropped from the list. The rest remained on the list which was published as a final order. Two additional lists were established, and the same procedure was followed. By 1961, there were over 500 substances on the GRAS list.

A second listing contains those substances for which a petition was submitted for a tolerance. After review of safety evidence by the FDA, a final order was issued for their use. Thus, we have many substances used as emulsifiers, sequesterants, antioxidants, preservatives, and so forth which use is regulated by a tolerance.

The Government, the scientific community, and the affected industry must take a searching look at all chemicals used in food production, whether they are called pesticides, food additives, or some other name, even though the uses previously have been regarded as acceptable. Additional testing will be required for a number of the chemicals.

All approvals must be subjected to periodic review and reappraisal so that changes may be instituted where the facts warrant.

Our review will concentrate on the GRAS list from which the cyclamates have already been removed.

In this regard, we are undertaking a number of concurrent events. First, we have entered into a contract with the National Academy of Science/National Research Council, Food Protection Committee to conduct an evaluation of items on the GRAS list. We, in the FDA, are conducting an extensive study and evaluation of the materials already existing in our files.

We are also working on reviewing our own criteria against which we judge the ingredients. We will probably be publishing more scientific guidelines and protocols in the evaluation of food additives. We are conducting a review of food safety to be certain that we are effectively using the best that science has to offer in 1970, as compared with earlier periods when the particular safety determination was made.

Consumers want better information about the nutritive quality of foods prepared outside their control. The increasing formulation of finished dishes in the factory, rather than in the kitchen, means that the housewife has lost, more correctly, perhaps, has given up what control she has had over nutritional properties of the end product. When these products contribute significantly to the calorie intake, we feel that they should also contribute significantly to overall nutrition.

To reach the goal of specifying the nutrients required, the FDA is considering the issuance of nutritional guidelines for a selected class of foods, possibly through the mechanism of the Food and Nutrition Board of the National Research Council. If and when these guidelines are issued, the pressures of the market place would cause many or even most of the processors of the foods concerned to adjust their formulations to meet the guidelines. We would expect the labels of the foods to communicate the fact that this has been done.

POTATO PROCESSING PATENTS -- A JUNGLE

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As a food technologist with no legal training, I have been associated with potato processing for 20 years and have been concerned to some degree with patents--primarily potato processing patents--for the past several years. If my experience is typical, those of you who have casual contact with patents are probably mystified by the patent system and are not at all sure what position you or your companies should take in regard to patents. Join the club! I doubt that there exists a company of any size in which there is unanimity of opinion on whether or not to venture into the jungle.

It is not my purpose to give advice on patent matters. There are many competent legal firms which perform this function. I will, however, comment briefly on such questions as: What is a patent? What is the value of a patent? Is my idea patentable? If so, is it advisable to patent it? Am I infringing? Is there anything left which can be done to a potato which hasn't already been patented?

What is a Patent?

A few brief comments about the evolution of the patent system may be of interest. In 1331, King Edward III made a royal grant to John Kempe and his Flemish weavers decreeing protection in return for practicing their art in England. Many of the kings derived needed income by granting monopolies to wealthy merchants for such necessities as salt. This practice soon became intolerable and was discarded. The first actual patent was granted in Venice to Aldus for his famous italic type. The first English patent was granted on a furnace in 1565. I was particularly interested in a patent granted in 1594 to Galileo for raising water and irrigating land. This outstanding scientist might be said to be the author of the first patent laws. In his application, he stated he had spent much labor and expense, and he petitioned that if nobody except himself could make, cause to be made, or use or alter for use, he, in return, would attentively apply himself to new inventions for the universal benefit. He was given a conditional 25-year term. He had to construct a unit within 1 year and if it were later shown that his machine was not new and novel, the grant would be rescinded. Anybody familiar with current patent legalese would be impressed by the similarity of the words to Galileo's petition. The first U.S. patents were established for "any useful art, manufacture, engine, machine, device, or improvement therein not before known or used." The granting body consisted of any two or more of the Secretary of State, Secretary of War, and the Attorney General. In the 3 years between 1790 and 1793, 57 patents were granted--the first was for a process of recovering potash from ashes and was signed by none other than George Washington.

In layman's language, a patent is a 17-year monopoly granted by the Government. It says in effect, "We have examined the invention carefully and studied all prior art in relation to it, and, to the best of our knowledge, it is new and useful." All patents have two main parts. The first is the specification or disclosure or body which publicizes information which nobody in the future can ever patent. The second part is the claims which define the invention and set forth that which no one else can do for 17 years.

Can I Get a Patent on my Idea?

There are a number of provisions in the statutes which would prevent a person from getting a patent, but in the majority of cases, the question of patentability hinges on whether or not your idea has been disclosed in the prior art or has been practiced. Any attempt to determine this with absolute certainty is doomed to failure. One can spend thousands of dollars searching and still not be sure that the invention was not disclosed in some obscure place or way. The classic example is that of a Ph.D. thesis written partly in longhand and with only one copy in existence located in a library at the University of Michigan. This document was judged to be a prior art publication because it was listed in their catalogue and was available to anyone who requested it. Usually, prior art searches are done by professionals who work with patent attorneys and do nothing but search domestic patent prior art. If you should wish to undertake searching yourself, you can go to the Patent Office search room and look at the Index To Classification in which subjects are listed alphabetically.

Under POTATOES you will find that eight main class numbers are listed. You then go to the Manual of Classification where the main classes are listed numerically. If your interest is in potato processing, most of the references will be found in Class 99, FOODS AND BEVERAGES. This is one of about 360 main classes and contains about 450 of the total of about 50,000 subclasses. If your idea relates to PRESERVATION, you have limited the subclasses to about 83. If the means of preservation is by Dehydration, you have further reduced the subclasses to 12--one of which is Subclass 207--Potatoes. In the stacks, you will find bundles of every U.S. patent issued on the dehydration of potatoes along with many which have been cross-referenced from other classifications. This usually is a stack from one to three feet high. After reading these, the only thing you can be sure of is that if you find your idea clearly disclosed, you can't patent it; however, if it is disclosed in an expired patent, you can practice it. Any U.S. patent with a number smaller than 2,645,000 has now expired and the teachings therein belong to the public.

If you don't find your idea disclosed exactly, but find some patents with similarities, these would probably be cited against your application if the difference between them and your idea would have been obvious at the time your invention was made by one having ordinary skill in the art. This is the time to resolve not to venture any further into the jungle without a licensed guide. Your patent attorney, after studying the relevant prior art, will make an educated judgment based on his experience. This is one of the thickest parts of the jungle because, right or wrong, you may some day have the validity of your patent tried by a very competent judge who, although he led his law class, doesn't even know that potatoes grow under the ground. It is his responsibility to decide whether or not, at the time of your invention, a person of ordinary skill in the art of potato processing would have considered your invention obvious if he had known of all the prior art. He has to be equally qualified in the other 49,999 sublcasses also!

Let us assume that you and your attorney have filed a patent application and after a short wait of about 18 to 24 months, you finally are advised that all of your claims are rejected. It is pointed out to you that you disclose washing and peeling of potatoes as steps in your process and that these are old steps. The Examiner establishes the truth of this profound statement by enclosing a 100-year-old patent in which Farmer Jones discloses that by washing his potatoes before taking them to market, he got a 10¢ per bushel premium. Another patent with a 1890 dating discloses a hand potato peeler which indirectly proves you weren't the first to peel a potato. This may be a slight exaggeration, but much of the prior art cited against us seems to fall into this category. Your patent attorney calms you down and assures you all is not lost and that in his response he will concede that these steps are not inventive and will convince the Examiner that your invention lies elsewhere.

A second impenetrable tangled mass is brought on by the Examiner's inevitable words "obvious in view of ---." Here, the Examiner may cite, for example, three patents--none of which are too close to your idea and may not even mention potatoes, and then will say in his remarks, "If Brown had employed the steps shown by Smith after treating as was disclosed by Jones, the result would have been the same as your invention; therefore, your idea is obvious and unpatentable." One must learn early in the game that if a patent examiner makes a statement, regardless of its validity, it becomes a fact if you let it go unchallenged. If your reaction is typical, you will be infuriated by the thought that it took months of hard work and years of experience to develop your invention, and now some clown smugly suggests that your invention would be immediately apparent to anybody who knows anything about potatoes. You wonder how such an intellect can be content with anything less than heading up R & D for a major conglomerate. Hopefully, just before your patience and resources are drained, you receive a Notice of Allowance and the lights go on again all over the world.

Is It Advisable to Patent? What Value Does a Patent Have?

In the first place, if you are in the potato business, you belong to a discriminated minority in the eyes of the patent law. You can't even patent a potato. The laws says that to get a plant patent, you must discover and asexually reproduce a plant other than a tuber propogated plant or one found in the wild. The purpose of such a provision was to bar patents on foods in which edible portion is planted for seed.

Company policies regarding patenting vary widely. Some companies patent everything possible; some patent nothing; and some take a middle course. Advocates for patenting cite such reasons as (a) protection of investment, (b) licensing of others for revenue, (c) prestige, and (d) to scare off competition. Good patents can accomplish all these things. If the patent is not good, it may merely disclose some trade secrets or provide enough information to encourage competition. In fact, patents are often withdrawn or abandoned after Notice of Allowance because they were judged to be unenforceable or too revealing. Whether a patent is good or bad is rarely a black or white situation. After a court decision in its favor, it must be considered good even if the foremost authorities in the field agree unanimously that the decision was incorrect. In one case to my knowledge, both sides presented directly opposing testimony as to what condition was clearly revealed by viewing a substance through a microscope. When the judge was asked if he would like to look, he honestly stated that if experts couldn't agree, why should he even bother to look? Yes! the jungle can be frustrating.

Our patent system differs in significant ways from almost all major countries except Canada. As would be expected, these differences have critics and supporters. As an example, most countries prosecute a patent in much the same manner as is done in the United States, but before granting, it is opened to the public for criticism on the assumption that somebody outside their Patent Office might possible know something that they don't. If valid undiscovered prior art or practice is presented and accepted, the patent is never granted although it exists in printed form and may scare off those who are not aware of the final disposition. In the United States, this practice is not followed and it is possible, although unlikely, that a patent may issue on a process which has been practiced commercially for years before the application was ever made.

A patent must be considered "good" if the owner can find somebody who will license under it rather than contest it. Usually, a business judgment must be made after consulting with patent attorneys and it may be sound business policy to agree to a license solely because this is the less expensive course.

Does What I am Doing or What I Would Like to Do Infringe an Existing Patent? Is a Product Currently Being Sold on the Market Protected by Patents?

In general, one should examine containers of products to see if patent numbers are displayed. If numbers are present, copies of the patents can be obtained for 50¢. It may be that the numbers refer to the package itself and have nothing to do with the product. If there are no numbers, and you have not been notified in writing to desist, you are generally safe. As usual, there is some hidden quicksand in the jungle at this point. If a valid patent exists, but it is not being practiced, it is, of course, not possible to mark this nonexistent product, and the owner could not have served notice if he were not aware of the infringement. Under these conditions, one could be liable for all production for 6 years prior to filing of an infringement suit. In theory, you are legally obliged to be aware of unpracticed valid patents.

The final point to consider is whether or not there is anything patentable which can be done to a potato which hasn't been done. Perusal of my files, which are undoubtedly not complete, show about 300 foreign and about 250 U.S. patents relating to potato processing. Of this number, 23 deal with fries, 44 cover chips and snacks, and 220 deal with forms of instant mashed potatoes, such as granules, buds, flakes, and shreds. Of course, some are duplicated, but are there really that many patentably different potato processes and products? I have skimmed through my jungle and found some patents of particular interest for one reason or another.

No. 1. In this process, potatoes are washed, boiled, peeled, trimmed, and extruded through a ricer onto tables where they are dried at 100° - 160° F. while being stirred.

You may feel free to practice this process if you wish because this patent expired in 1862.

No. 2. Potato technology was further advanced by this disclosure in U.S. Patent No. 611,017 granted in 1898. In it, I find the first mention of the role of sulphur dioxide in potato processing. "The chief purpose of subjecting the potato to the action of sulfur dioxide is to effect a disintegration of the tissues--such as cellulose. This also neutralizes the salt, separates all slimy and fatty matters and dissolves the albuminoids--and helps to effect a speedier solution of the starch in the final product. The potatoes are boiled in alkali to remove any atoms of sulfurous gas that may still remain suspended in the potato and prevent the formation of sulfuric acid. Mashing when cold is important as it keeps them not only mealier but a brighter color. The end product when dissolved in hot water not only has the appearance, the sweetness, the flavor, and consistency of freshly cooked mealy potato, but is superior because of the elimination of impurities." All of this was known in 1898.

No. 3. There really wasn't much incentive for future research after this patent was disclosed. Potatoes were cooked, peeled, mashed, salted, and peppered, and spread in thin sheets and exposed to the air. Before they had time to ferment or sour, they were dried until brittle and ground into a fine flour. The product could not decay, ferment, or become affected anymore than corn meal, and was adapted to be exposed to all climates--such not being the case with the unprepared potato which soon decays or loses its fine flavor and nutritive qualities. A bushel furnishes 4 to 6 quarts and is particularly adapted to Army use and furnishes an article of food greatly needed, and which, if employed, would save many lives each year. For domestic use, it is almost indispensible when once introduced. For ordinary table use, add as much water as it will absorb, heat and it will be similar to ordinary mashed potato. In its concentrated state, it is equally adapted for forage where the difficulties of transportation will not admit of the ordinary food for horses. You may use this process too, if you wish, because this patent was granted in 1863.

No. 4. A fundamental concept of patent law is that one is safe in following an expired patent. Consider the first flake process which I found in my files. "Potatoes are prepared, cooked, mashed, and water added to make a thin pulp which is then strained to remove lumps and foreign matter. This pulp is then dried on highly polished metal to form thin sheets. The sheets are broken into flakes and may be utilized as a food without further preparation or by simply adding water. This process was patented in 1903.

No. 5. The first patent which claimed to make potato granules was granted in 1900 in England. The confusing aspect is that the process is almost identical to the above flake process. The only difference was the resulting product of the process.

No. 6. You may be interested in an early explanation of the merits of blanching potatoes. A 1904 patent contains the following explanation: "Pieces of potato are boiled 3 to 4 minutes--never over 4, and immediately thoroughly cooled for the purpose of destroying the poison contained in the potatoes when in a raw state which prevents preservation for any length of time."

No. 7. The first perfect shred was patented in 1912 and contained the following information: "Potatoes are peeled, cooked and forced through a screen without destroying the cellular structure. They are then dried with hot air of 100-180F. One must use temperatures insufficient to produce material changes in composition of the potato or to remove water of constitution. When remoistened, they are perfectly returned to their original condition."

No. 8. In 1919 it was disclosed that when pieces of potato were partially cooked and then subjected to the action of cold water, the potatoes became deprived of their tendency to stick or mat together. This disclosure is widely used today.

No. 9. In 1922, one-eighth inch extruded filaments of cooked potato were dried in air and were found to have a tubular bore extending throughout their length. Mashed potatoes could be made by adding boiling water or milk for 2 minutes and then beating. Twenty-seven years later this process was improved by an aerating step before extrusion which resulted in a more porous piece.

No. 10. The commercial granule process is of interest partly because of the interesting names of the early workers. The process evolved from early work in 1936 by Faitelowitz and Buminovitch, who predried cooked potato pieces and then formed a damp powder. In 1938 a mixing step during predrying was disclosed by Volpertas. Rendel disclosed mixback in 1944 and finally Rivoche got his patent in 1948 in England and in 1950 in the United States with a priority date of 1937 due to the complications of World War II. These patents which held up in English courts were shot down in the United States.

I have repeatedly made reference to the necessity of obtaining good legal advice on all patent matters. This is a field of specialty and is a jungle you should not venture into alone unless you are well heeled. If you don't know that a four-legged stool comprises three legs, don't even consider a safari. An excellent true story of the value of a good patent attorney is found in the case of the patenting of the telephone. Both Alexander Graham Bell and a man named Grey filed on the same day. Grey filed on A New Art of Transmitting Vocal Sounds Telegraphically, whereas Bell filed on Improvement in Telegraphy. Bell's attorney inserted two statements, one of which said "There are many other uses to which these instruments may be put, such as simultaneous transmission of musical notes, differing in loudness as well as pitch, and the telegraphic transmission of voices or sounds of any kind." This alertness to recognize the breadth of Bell's invention to include the concept of the telephone made the name Bell as much a household word as Spiro Agnew. The name of Don Ameche is probably more familiar in connection with the telephone than that of the unfortunate Mr. Grey.

In conclusion, let me paraphrase Harry Truman. If you can't stand the sweat, the dangers, the chaos, and the confusion, stay out of the patent jungle!

EXPERIENCE IN SHIPPING POTATOES IN CONDITIONAIRE CARS

T. U. Coulson
ACF Industries, Inc.
St. Charles, Mo.

At your conference in 1968 in Corvallis, Ore., Ken Curry of ACF Industries described our prototype bulk potato car. The title to his presentation was "Developments Leading to Bulk Transportation of Potatoes." At that time ACF had in operation only one prototype bulk produce railcar, which we since have named Conditionaire. Also, there were plans to lease for a 1-year trial use to the Northern Pacific Railway 10 preproduction cars. Today, the car has proved itself, and the Burlington-Northern owns 51 cars.

I'll try not to get too technical but rather present information to bring you up to date on the progress of bulk shipping of potatoes in refrigerated covered hopper cars. Here are a few pictures reviewing the overall car, its operation, and its concept. Some of you, I know, have seen these so I will keep the review very brief.

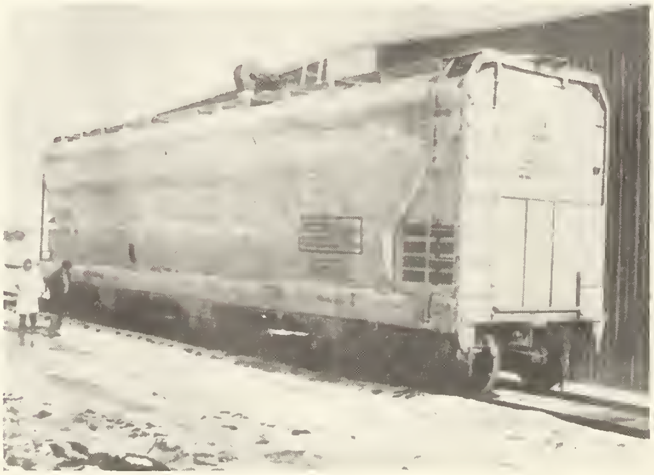

Figure 1.--The prototype mechanical refrigerated covered hopper car. This car moved 10 loads of potatoes in 1968 as a test program from the North, Southwest, and Western areas. It has exterior coated polyurethane foam insulation.

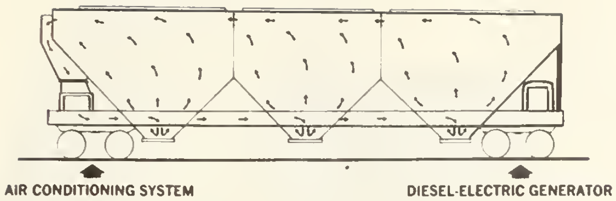

Figure 2.--Air flow diagram and hopper outline. Air is drawn off the top of the load, conditioned, and forced down the side sills and moved up through the product at an even rate between hoppers, about 1.4 cfm of air per hundredweight of potatoes.

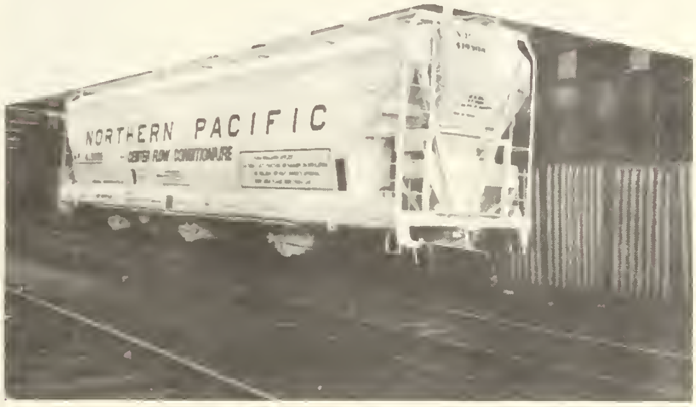

Figure 3.--First of 10 Northern Pacific cars, painted white to reflect sunlight with a diesel engine on one end and air-conditioning system on the opposite end, 183,000-pound capacity.

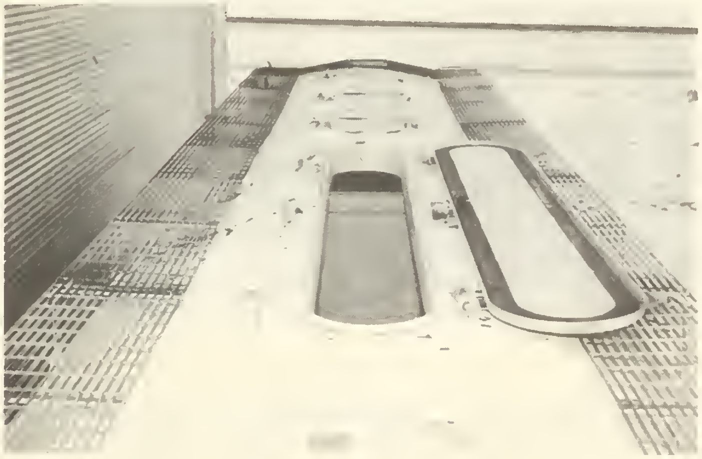

Figure 4.--Top view. A full-length, 20-inch wide hatch is over each of the three hoppers.

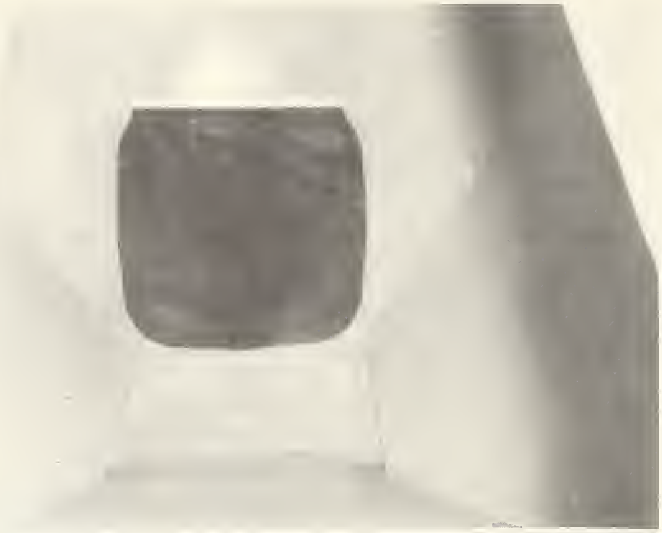

Figure 5.--Inside view from top. Hoppers slope 45° to the bottom where a sliding gate outlet allows complete cleanout and easy cleaning. The black bag serves as a bridgebreaker and, when inflated after opening the gate, initiates the unloading.

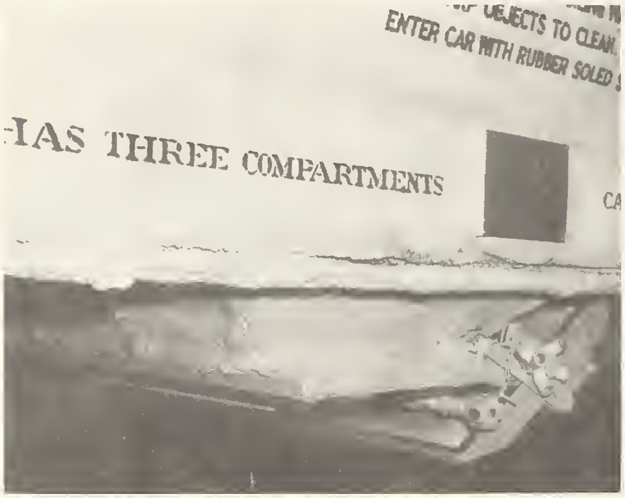

Figure 6.--Outlet. Sanitary shield clamps over outlet and keeps road dirt, moisture, and temperature from the bottom of the hopper. Shield swings out of the way as shown to expose horizontal sliding gate.

Our criteria for a bulk-produce car, as presented to you 2 years ago, was first one of large size to handle full rail capacity. This criteria was met with the production car having a capacity of 183,000 pounds. While admitting that this is a large car for many fresh potato repackers, ACF is convinced it is the optimum size for serving both the potato processor and repacker.

The second criteria presented was a quality-control system that must be as close to perfect as possible. We believe we have accomplished this. Extensive tests have shown a very narrow product temperature range throughout the load. If we have a secret here, it is in the airflow where the conditioned air is forced uniformly from the bottom of the hopper up through the produce. A correct amount of air is assured of going into each hopper. Here are two graphs illustrating the product temperature during shipment. This first (fig. 7) comparison shows a typical winter condition with a low-ambient and a high-thermostat setting. The hatched area represents the potato temperature. These potatoes were shipped for processing purposes from storage. The second (fig. 8) comparison shows a high-ambient, high-product-loading temperature, and a relatively low-thermostat setting. The latter represents shipment of chip-grade potatoes from the field.

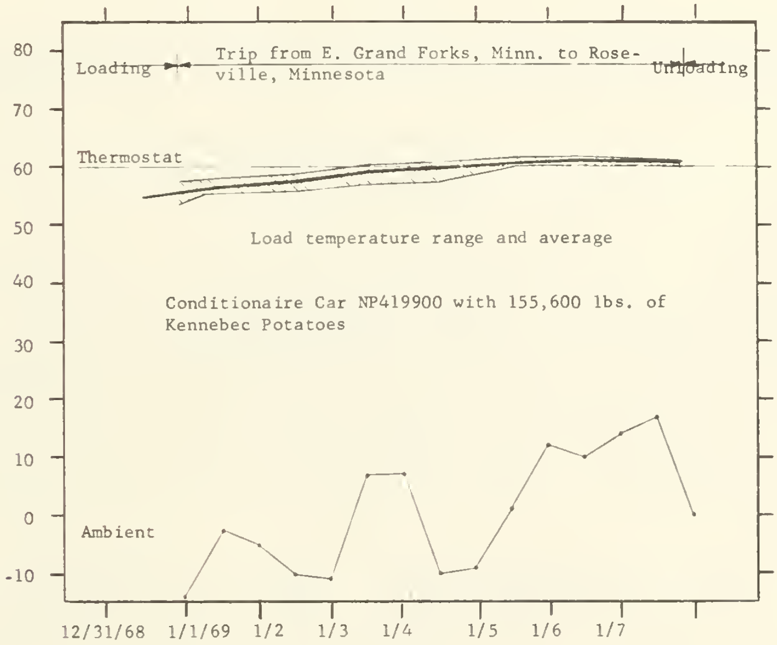

Figure 7.--Product temperature during shipment under winter conditions.

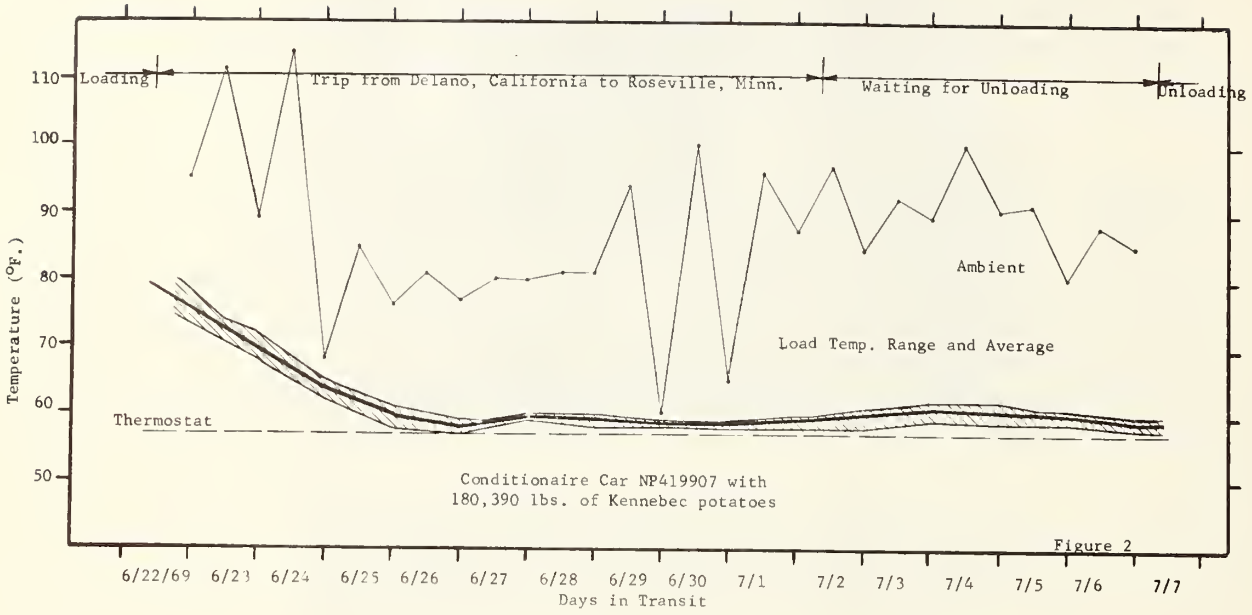

Figure 8.--Product temperatures during shipment under warm weather conditions.

The third criteria set up in 1968 was for a car that was not limited only to potatoes. As of this date, the Conditionaire has hauled successfully potatoes, oranges, grapefruit, bulk-package and bulk-loose carrots, and onions. Plans are being made to ship pears for processing, canning beets, lettuce, and possibly sweetpotatoes and celery. Grain has always been a possibility for a backhaul use, and the Burlington-Northern is presently making trial shipments.

The final criteria for the car was one that did not require extensive production costs. This was accomplished by using a basic Center Flow covered hopper car, similar to cars used to ship grain, and modifying it to become a mechanical refrigerated covered hopper car. Thus, the car is compatible to covered hopper car production and is produced in our Huntington, W. Va. plant.

Let me tell you of the experience we have had in shipping potatoes in Conditionaire cars. During 1968 the prototype Conditionaire car made 10 trips with potatoes to processors. The first of these trips was covered in Ken Curry's speech to you. The potatoes shipped were newly harvested as well as stored potatoes. They were loaded and shipped in ambient temperatures of below zero and above 100°F. From this ACF learned a lot about potatoes and how they should be shipped. Many of you here gave us invaluable assistance from the very start and have continued with your help. Largely as a result of your assistance in providing shipping parameters and cooperating with trial loads, our program has moved very quickly.

At the end of 1968 the Northern Pacific leased for a 1-year trial period 10 preproduction Conditionaire cars. These 10 cars during 1969 completed a total of 104 shipments. The following chart shows the breakdown by product shipped.

Total shipments of all products in Northern Pacific Conditionaire cars during 1969 (10 cars in use):

Processing-stock potatoes-------------87 loads
Table-stock potatoes------------------12 loads
Precut seed potatoes------------------ 1 load
Citrus-------------------------------- 2 loads
Fresh carrots (1-lb. bags)------------ 1 load
Processing carrots (loose)------------ 1 load

While the majority of the potato shipments during 1969 originated in the Red River Valley, there were 18 loads from California. One California load was of Long White table potatoes. The following chart shows type and number of loads of potatoes shipped last year:

Potatoes shipped in Northern Pacific Railway Conditionaire cars in 1969 (10 cars in use):

Red River Valley---63 loads, chip stock, storage supply
Red River Valley--- 6 loads, table stock, storage supply
California---------17 loads, chip stock, Kennebec, field supply
California--------- 1 load, table stock, Long White, field supply
Arizona------------ 5 loads, chip stock, field supply
Washington State--- 5 loads, table stock, Russet Burbank, field supply
Colorado----------- 1 load, chip stock, field supply
Colorado----------- 1 load, precut seed potatoes
Nebraska----------- 2 loads, chip stock, storage supply
Maine-------------- 1 load, processing stock, storage supply

Shippers of potatoes in the Conditionaire have consistently been loading the car with 170,000 to 180,000 pounds of product. The weight varies some among shippers and, of course, among the type of potatoes.

Dr. Don Hudson, located at the Red River Valley Potato Experiment Center, East Grand Forks, Minn., as you recall, gave a progress report at your last year's conference on a study he conducted during 1969 covering handling losses and temperatures occurring in bulk winter rail shipments of potatoes.

The study included Conditionaire shipments as well as other shipments. I understand Dr. Hudson since has analyzed additional data and a final report is now being printed by the Agricultural Research Service. You might wish to watch for the report as I am sure it will provide worthwhile data on all types of bulk railcars.

The Northern Pacific placed an order to buy 51 Conditionaire cars after using the 10 trial cars for only 3 months. They received their 51 new Conditionaire cars this past winter. The cars were used, of course, in the Red River Valley during the remainder of this past season. In May, June, and part of July the cars were used here in California to ship potatoes to processors in the North. Presently they are starting to be used in the Washington State Area moving Russet Burbank table stock potatoes.

The first group of 10 Conditionaire cars that were leased to the Northern Pacific have been returned to ACF. They have been repainted and are now in demonstrator service. Five are being operated on a short-term basis with the Santa Fe. Two are on a short-term demonstrator lease with Triple A Packing in Medford, Mass. One car has been used with onion test shipments out of the Southwestern part of the United States and the other two have been used for new product and new market introduction.

Triple A Packing first used their two cars in Idaho making the initial legal Idaho bulk potato shipments. I am sure you have heard that the Idaho laws now permit bulk potato shipments. The Idaho Potato Commission watched these loads closely and made a comparison study between current shipping practices and Conditionaire shipping.

On the Santa Fe Line during the past 2 months, 11 loads of California Long White potatoes have been shipped from Shafter, Calif. to Triple A Packing in Medford, Mass. The receiver has been very satisfied with the shipments.

The Transportation & Facilities Research Division of the ARS-USDA, cooperating with the Potato Growers Association of California, is presently conducting a study on the shipping of California Long White table potatoes in the Conditionaire car. Their study is to evaluate both the economical and physical feasibilities of shipping California potatoes in bulk in the Conditionaire car. When their study is completed it, I am sure, will have some interesting information.

The car thermometer on a conventional mechanical reefer will more quickly show the thermostat set point than a Conditionaire car. It does not indicate necessarily the product temperature. I will show you an example of this later in my presentation. The mechanical car has more refrigeration capacity since it is designed for frozen foods and carries less product weight. In addition, the top of the car acts as a plenum chamber which allows the air to move in the car through the path of least resistance. For the most part this is around the sacks or cartons and down the sidewalls. In contrast, the Conditionaire car has the conditioned air forced evenly to the bottom of each hopper where the air has no option but to go up through the product voids.

One of the characteristics of the Conditionaire car is that the car thermometer more clearly reflects the pulp temperature of the potatoes than car thermometers of mechanical refrigerated cars of sack potatoes. This is a problem, as on many railroads it is normal practice to remove a mechanical refrigerated car from a train as a problem car if the thermometer varies 5° from the thermostat-set point. This has been a quick and fairly accurate way to determine air-conditioning problems.

For the shipment of stored potatoes, where product temperature is not required to be changed appreciably enroute, the reading of a Conditionaire car thermometer as an indicator of mechanical malfunctions is, of course, a satisfactory procedure.

The Conditionaire car is designed strictly for fresh produce. It has less temperature differential between the air coming out of the load and the air going into the load. This is a design feature built into the car as you potato people have told us that a gradual reduction of potato temperature is advantageous.

I would like to show you a chart comparing product temperature of Long White potatoes in the Conditionaire car compared with a mechanical refrigerated car of 100-pound sacks.

These two loads were loaded on the same day but were not shipped on the same train so while the ambient temperatures are very similar they are not exactly the same. In addition, the Conditionaire thermostat was set at 48°F. while the mechanical refrigerator car was set at 42° which is another dissimilar comparison. But, the charts do tell a story. Let me also point out that while one comparison is certainly not average, the Conditionaire performance data is indicative of what we have come to expect.

The product temperature, as recorded on Ryan recorders, shows that the variance for the Conditionaire with 173,420 pounds of potatoes (fig. 9) is within + or -2°. The circles show the location of the recorders. It took 2 days to bring the temperature down to 60°F. It took 4 to 5 days to bring the potato temperature down from about 75° to 50°, an average of about 5° to 6° per day. The car thermometer read 56° after 3 days and 50° after 4 days.

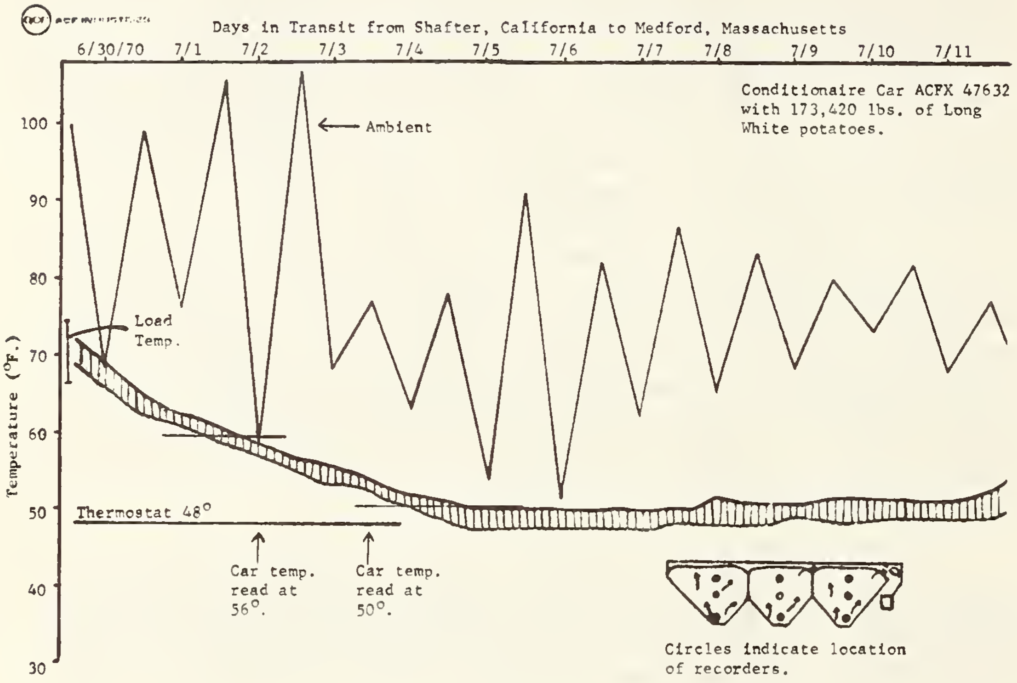

Figure 9

The mechanical car with 600 sacks shows a different story (fig. 10) in cool-down rate. Most important is the

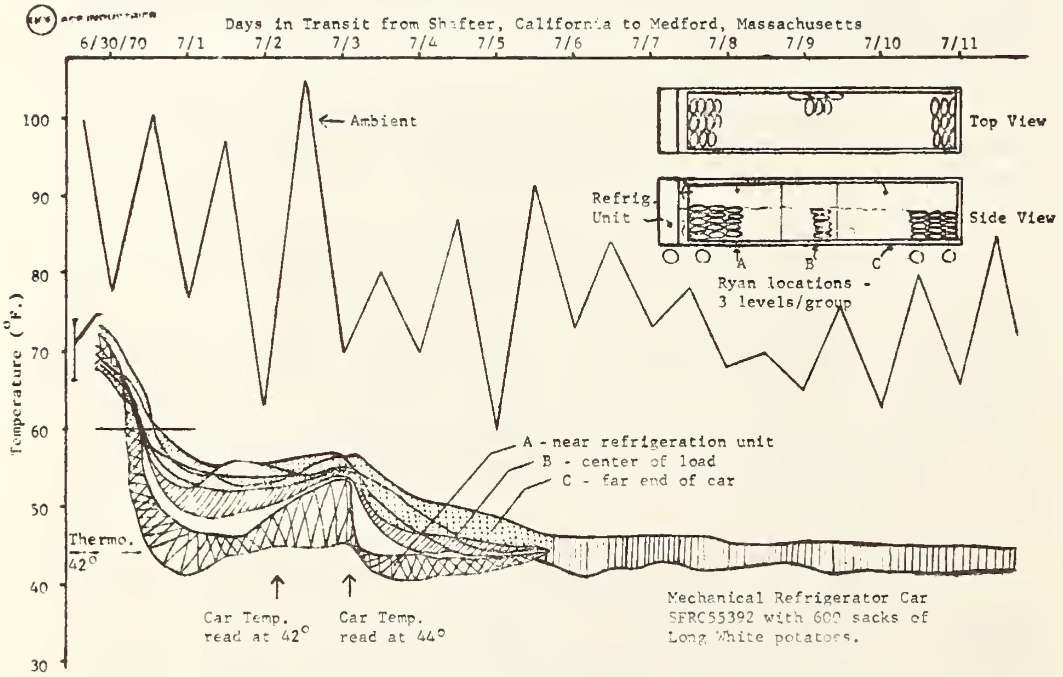

Figure 10

range of product temperature. The circles again show the location of Ryan recorders. The recorders were placed in sacks at three levels in three groups, a total of nine recorders. Group A near the refrigeration unit, Group B near the doorway, and Group C near the opposite end from the refrigeration unit. As you can see, the total load came down to 60°F. in 1 day. The A end cooled quickly, then there was a stabilization period of about 5 days before the potatoes reached the thermostat set point. During this time the potato temperatures ranged from 41° to 56°. The car thermometer read 42° after 2 days and 44° after 3 days.

This illustrates the point I made earlier about the car thermometer not reflecting the potato temperature. I would expect this pattern to vary considerably with the type of container, stacking arrangement, and size of load. I am not trying to imply that the conventional mechanical car is not suited to shipping potatoes. In fact, both cars were accepted by the receiver. I am only showing the difference between the two cars in the product temperature as measured by Ryan recorders placed inside the potato sacks.

Before I go into our plans for the future here are some pictures (figs. 11 to 16) on the loading and unloading of Conditionaire cars:

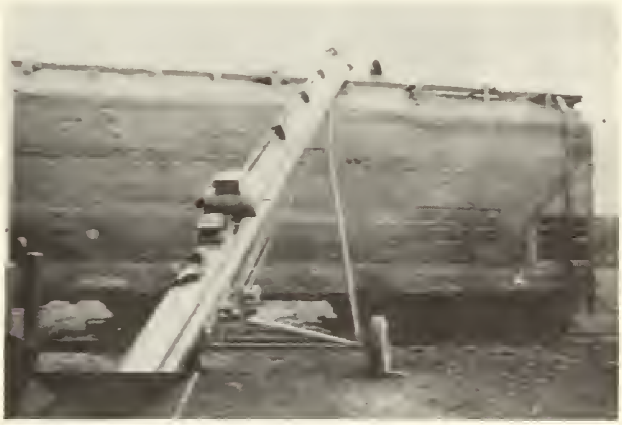

Figure 11. Bin loader. Bin loaders of the type necessary to raise potatoes to the top of the Conditionaire car are found in most storage areas.

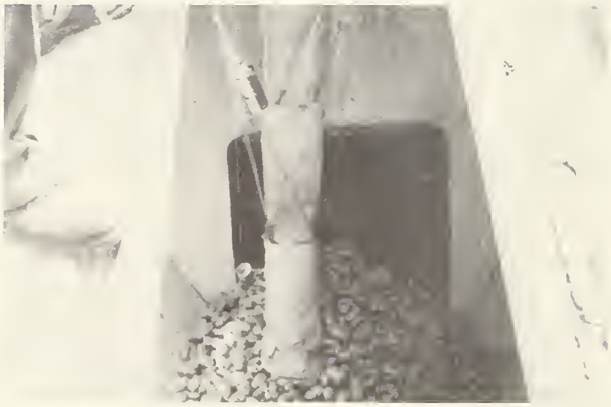

Figure 12. Canvass chute. There are two types of canvass chutes. One has baffles to lower the potatoes through a series of small falls and second type is used by filling the chute completely full and metering the potatoes out the bottom at the same rate they are loaded in the top.

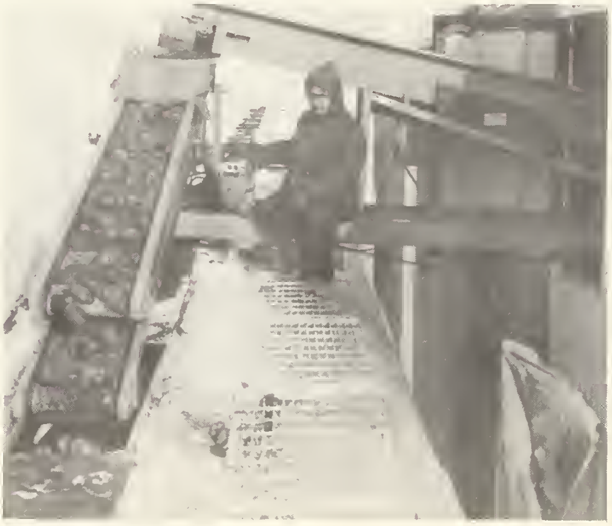

Figure 13. Conveyor. This conveyor extends and tilts into the bottom of the hopper, retracting as the hopper is filled.

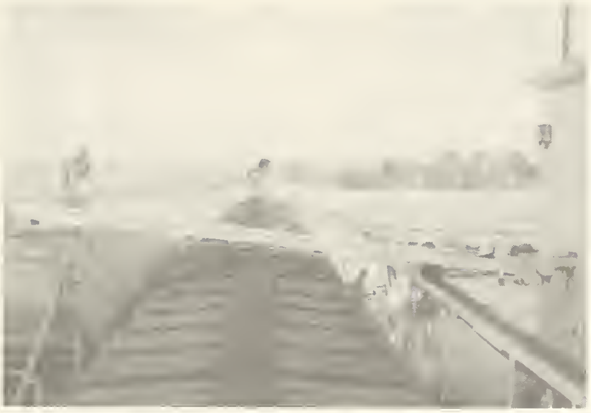

Figure 14. Top conveyor. The top conveyor swings out from the shipping shed over the top of side-loading cars that are placed on the inside track, while the Conditionaire is filled on the outside track.

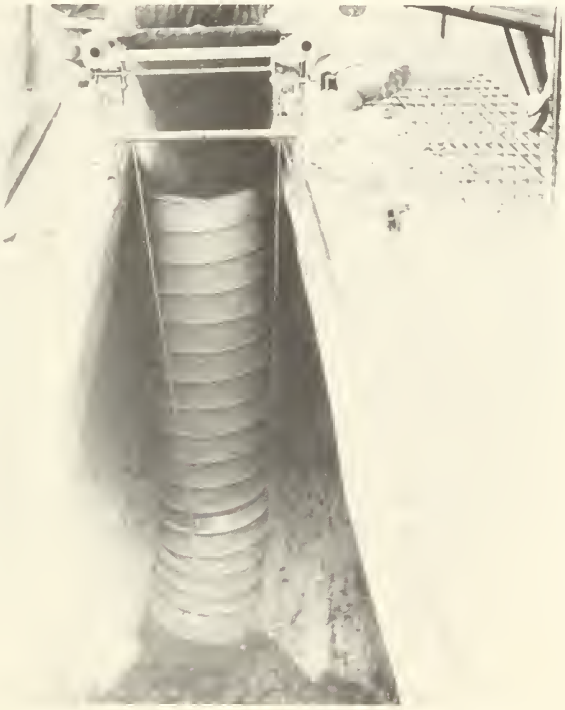

Figure 15. Bellows-type chute. This chute extends down to the bottom of the hopper when the load is started. As the hopper is filled, the operator cranks the bellows upward, collapsing the chute. It requires an operator to meter the product out with a control rope, being careful to keep the chute full at all times.

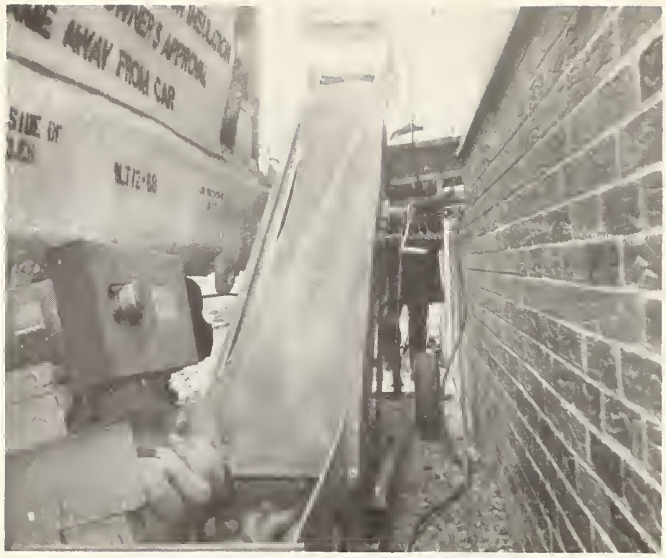

Figure 16. Unloading conveyors. A conveyor is placed under the hopper on top of the rails. From there it is conveyed to the top of the dock and to a repacking line or into storage pallet boxes. Only a 20 in. space is required to convey potatoes from the ground level up to dock side between the car and the dock.

In the future ACF plans to continue using the original 10 cars for demonstrations to both interested railroads and interested industrial companies. Three loads have been shipped in the Conditionaire from Idaho as test shipments, and quite a bit of interest has been generated. The State of Maine has been shipping bulk for several years as the Bangor & Aroostook Railroad was the first to convert RS ice-bunker cars to bulk potato use. Quite a bit of interest has been shown and we expect to see more Conditionaire bulk potato shipments from the State of Maine next winter. The California growers and the Santa Fe are showing a lot of interest, as evidenced by the recent trial program. We are continuing to broaden the use of the car in new product areas as I mentioned at the beginning of my presentation. Onions, carrots, citrus, and certain processing fruits and vegetables are being test shipped.

POTATO FUTURES

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The risk of adverse price fluctuation during a marketing period is a very real hazard of the potato business. Many businesses dealing in fresh potatoes, however, can protect themselves against a considerable portion of this price risk by using potato futures. Through the appropriate use of futures, they can both fix the approximate price they will pay for anticipated supplies needed later in the season and protect the value of a previously acquired inventory. The judicious use of futures as a procurement and inventory management tool should facilitate decision making in these areas and lead to increased operating profits over the years.

Futures markets are available dealing in Maine-grown Katahdins and Idaho Russets, enabling most dealing in fall potatoes to hedge effectively. Even though potatoes are grown in other fall producing States, reliable cash-futures price relationships permit hedging of those potatoes too. Each consumer should compile a record of these relationships for, say, the past five seasons. First, let us review the basics of a futures market and then illustrate how processors and retailers of fresh potatoes can benefit by utilizing potato futures.

Trading in futures markets is basically a simple operation, conducted on various commodity exchanges. These exchanges are organized markets where traders meet to buy and sell contracts for future delivery of specified grades and qualities of the various commodities in which futures trading is conducted. The exchange itself provides the physical facilities for trading and sees that rules uniformly applicable to all trades are obeyed. The exchanges are public markets, in that anyone who has met the requirements of a member brokerage firm can participate in futures trading through the member firm. Thus, one does not have to be in the potato business to buy and sell potato futures.

In reality there are two classifications of participants in these markets: One type is the speculator, who has no reason to handle the actual commodity. The other participant, businessmen like yourselves, own or have a future requirement for the commodity. They are called hedgers.

A speculator, simply buys when he believes prices are low and sells when they appear high. He willingly accepts price risks, that the potato businessman wishes to avoid, solely in the hope of making a profit. Speculators provide liquidity to the market and present the hedger with an environment to limit price risk. On the other hand, the processor or retailer uses the futures market to limit price risk by hedging. He does so by taking an opposite position in futures to that held or anticipated in actuals. For example, a large consumer of fresh potatoes, such as a french-fry processor, who has a subsequent need for potatoes, could hedge by buying futures. The holder of an inventory of potatoes or one who had contracted for supplies could hedge by selling futures. As the actual potatoes are purchased or inventory consumed, the hedge would be removed by liquidating an equivalent amount in futures contracts. Using futures to hedge should not significantly alter traditional procurement and marketing procedures of the business. Hedging is possible because cash and futures prices tend to move in the same direction, and converge as the contract matures. Thus, higher cash prices would, at least in part, be offset by a gain in futures for a buy hedger. Should prices subsequently decline, however, his ability to acquire actual supplies at a lower cost would largely offset a loss in futures. The net effect of a sell hedger's cash-futures transactions would reflect similar relationships.

Futures trading in potatoes is conducted on two commodity exchanges: the New York Mercantile Exchange and the Chicago Mercantile Exchange. The New York Mercantile Exchange offers a contract trading in Maine-grown Katahdins. The Chicago Mercantile Exchange conducts trading in an Idaho Russet contract which, to date, has attracted considerably more interest than a similar contract at New York. These contracts all specify 50,000 pounds of U.S. No. 1 Size A potatoes either grown in Main or Idaho. Other quality standards also are prescribed by the contracts, as are points of delivery.

Several factors should be taken into account before initiating either a buy or sell hedge. An important hedging consideration is the "basis." Briefly, the basis is the difference between current cash prices and a futures contract. For example, let us assume that Maine cash is currently $2.00/ cwt. FOB Presque Isle and March Maine futures are quoted at $2.95. Adding 83¢ freight to New York to the FOB price, we have a delivered price of $2.83, resulting in a basis calculation of 12¢, or 2.95 less 2.83. Traditionally, deferred potato futures contracts are at a premium to the prevailing cash markets. When this differential is narrow, buy-hedge opportunities are enhanced. Conversely, when futures are at a large premium over current cash, a sell hedge against previously acquired inventory might be indicated.

A hedge should only be initiated when ingredients appear favorable. Hedging should be considered as a business tool, to be used only under appropriate circumstances. For example, during the 1967 season, supplies were very burdensome, and finally a Government diversion program was instituted to dispose of the crop. Under these conditions, a buy hedge would not have been prudent, particularly because futures possessed considerable premiums to cash quotes.

Moving to a specific illustration of a buy-hedge program, let us assume that your anticipated requirements were for 20 cars of Maine potatoes during the winter of 1969. You could have used the March Maine 1970 contract to hedge, as this contract month would most closely reflect supply/demand conditions between harvest time and March. From mid-October to mid-November a buy hedge would have been wise, as the basis was attractive. Even more significant, going cash was actually at a premium to March futures, sometimes by as much as 30 points. The price of needed supplies could have been established well in advance, and at better levels than those offered by the cash market. Details of the use of futures as an alternative means of procurement and forward price-fixing would appear as follows:

Futures Transactions	Date	Cash Transactions
Buy 5 March at $2.60	Oct. 17	NIL @ $2.80/2.90
Buy 5 March at $2.70	Oct. 28	
Buy 5 March at $2.75	Nov. 5	
Buy 5 March at $2.70	Nov. 14	

Then as you subsequently bought your actual supplies, you would have simultaneously liquidated an equivalent amount in futures. Perhaps your production schedule required four carlots of physical potatoes every 2 weeks from early December to about the 1st of February. Purchases in the cash market would be completed through traditional channels as required. Results are summarized below:

Cash Transactions	Date	Futures Transactions
Buy 4 cars at $2.60	Dec. 8	Sell 4 March at $2.75
Buy 4 cars at $2.75	Dec. 22	Sell 4 March at $3.05
Buy 4 cars at $2.85	Jan. 5	Sell 4 March at $3.45
Buy 4 cars at $3.40	Jan. 19	Sell 4 March at $3.65
Buy 4 cars at $3.30	Feb. 2	Sell 4 March at $3.50

Without employing futures, your average cost in the cash market would have been $2.98 cwt. delivered New York. A net profit of 53¢ per cwt. in futures, however, lowered the average cost of the potatoes to about $2.45 cwt., resulting in a raw material cost saving of approximately $5,300 for the 20 cars. For consumers utilizing Idaho Russet potatoes, the Idaho Russet futures market on the Chicago Mercantile Exchange could be used in a similar manner. Remember, the general rule that a futures premium to going cash, adjusted for freight, should not be too excessive.

A processor or retailer who had acquired an inventory or contracted for supplies would, at appropriate times, consider a sell hedge. As suggested previously, when deferreds were at a significant premium to cash, a sell hedge becomes particularly attractive. Such an occasion was witnessed during the January/ February period of this year, as shown on the chart overleaf. Had previously acquired inventory been hedged during that period, an improved profit margin would have realized than that provided by cash dealings alone. Of course, in this sell-hedge instance, futures could have been bought back - liquidated - when the physical potatoes were processed or retailed, or possibly when the futures premium narrowed significantly.

In summary, we can say that most operations using fall potatoes can benefit through potato futures transactions by fixing an acceptable price early in the season for needed supplies. Remember also, that had inventory been taken on and a suitable premium existed in futures, a sell hedge might be feasible. Some elements of the potato industry need not confine hedging applications of futures to potatoes alone. Potato consumers, particularly chippers and french-fry processors who use large quantities of soybean oil in their operation, should investigate the use of oil futures contracts to manage price risk. Fluctuations in the value of this commodity have been quite large and often have a greater impact on operating profit than those of potatoes.

RECOVERING PROTEINS FROM POTATO STARCH FACTORY EFFLUENTS: PROGRESS AND PROSPECTS

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The potato starch factory waste problem is virtually a microcosm of all the waste-treatment problems plaguing the potato processor. In the starch factory problem all the difficulties are magnified; the effluent has the highest BOD and is the least amenable to conventional treatment. Because of the economic debility presently afflicting the starch industry, high waste-treatment costs present the manufacturer with the dismal alternative of phasing out starch production. Yet, is this a solution in keeping with the times--an era of ecological awareness when waste disposal is an integral and necessary part of any industrial planning? After all, the potato starch industry depends primarily on the culls and scraps from the other processes for its raw material. In acting as a scavenger it is doing necessary waste-disposal work. Therefore, before we replace one waste-disposal problem by another, we should carefully examine other possible solutions.

Besides the conventional biological methods, there are two other approaches to the waste-treatment problem: (1) Modify the process, and (2) recover valuable byproducts to pay for part or all of the waste treatment which is mandatory. Using the second approach, the Eastern Division of Agricultural Research Service is studying those problems facing the potato processing industry. Thus far we have confined most of our attention to the potato starch problem, but we hope that our basic approach and research findings can be applied to other processing problems.

Reduced to its elements, potato starch manufacturing is the physical separation of the starch particles from the potato cells, leaving a pulp fraction and liquid fraction known as the protein or fruit water. This liquid contains the bulk of the potato solubles we are interested in recovering. Roughly, the relative amounts of these are: Protein 10-15 percent, amino compounds 30 percent, organic acids 30 percent, potassium 10 percent; and sugars 15 percent (table 1). The amino compounds, organic acids, and potassium, as reported by Dr. Porter of this Division at the 18th Utilization Conference, can be removed by ion exchange. However, before this can be done, the protein must be recovered or else it will precipitate in the ion-exchange columns, causing liquid channelling and loss of column efficiency.

The recovery of proteins from starch factory effluents has long been a formidable challenge, technically and economically, to the engineer. Low yields, poor filterability, extreme dilutions, and scaling have consistently doomed the previous attempts to failure. From what has been reported, only precipitation by steam-injection heating seems to have survived in Europe and Japan. While the method has certain advantages which will be enumerated shortly, there are no published engineering data. Hence, we had to investigate its suitability for our purpose.

Before these studies are discussed let us look at the advantages of the steam-injection method and then consider what questions remain to be answered. The advantages are (1) highly efficient heating because it avoids the scaling encountered when tubes are used, (2) simplicity of operation, (3) takes up little room, (4) low initial and maintenance cost, (5) great flexibility in operation, that is, a wide range of temperature and turbulence (which promotes coagulation) is possible.

These advantages notwithstanding, certain important questions had to be resolved: (1) Is the protein recovery sufficiently quantitative to permit the efficient recovery of the other valuable compounds by ion exchange? (2) Are the amino acids adsorbed by the precipitated protein? (3) How pure is the precipitated protein? (4) What is the best solid-liquid separation method to recover the proteins after precipitation? (5) What is the best method for drying the proteins? The answers to these questions will now be discussed.

The experimental unit we have been using consists of a steam-pressure regulator, the injector unit, a surge chamber, a vapor-liquid separator and a condenser (fig. 1). We found it necessary to incorporate a surge chamber to ensure steady state operation. The purpose of the vapor-liquid separator and condenser is to make an accurate material balance of the steam consumption. There is a valve in the liquid inlet and also a valve in the injector outlet which is used to throttle the liquid-steam mixtures; this enables us to reach temperatures above 212° F. rapidly. There is a valve in the outlet line from the surge chamber. This has a two-fold purpose: (1) Maintain a slight pressure in the chamber to prevent foaming; and (2) adjust the flow rate to give steady state operation. The liquid (if superheated) is flash cooled to 212° F. in the separator and the vapor flashed off is condensed in the condenser. The liquid leaving the vapor-liquid separator passes to a dewatering system where the coagulated proteins are separated by settling, filtering, or centrifuging after which they are dried.

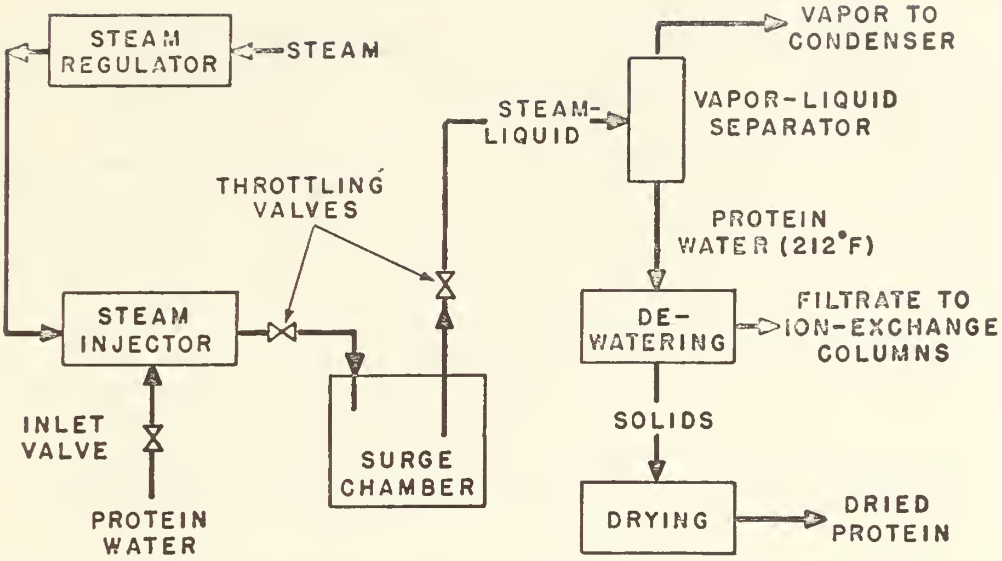

Figure 1.--Recovering proteins from starch factory effluents by steam injection heating.

Two important factors affecting coagulation of protein are solids content and pH. Therefore, we first studied their effect on the percentage of the proteins coagulated. In these tests we employed the so-called detention time studies which are used to investigate the sedimentation of slurries (fig. 2). These studies reveal

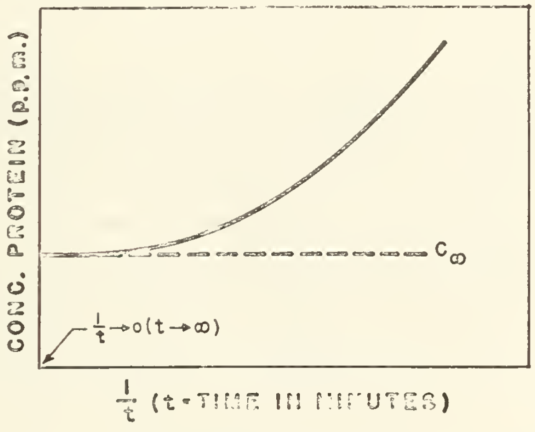

Figure 2.--Determination of C_∞ (Fitch, B., 1962, Trans. A.I.M.E. 223, 129).

the amount of unsettled protein and the detention time; that is, the time it takes to settle all the precipitate that is going to settle by gravity. The unsettled proteins are determined by filling a series of bottles, sampling each at midpoint and at a definite time interval, analyzing for protein, and then graphically determining the concentration of protein that would remain after infinite settling time.

Now, let us see what we learned from these settling studies. In all the experiments to be discussed, the protein water was first heated to 214°-220° F. using steam at 50 p.s.i.g., then flash cooled to 212° F., after which the settling studies were made. The protein water was prepared in our pilot plant to the desired solids content; in the first series, this was 1.5 and 2.8 percent to duplicate the protein water of most American starch plants, the soluble solids of which lie in this range. In the fresh protein water the pH ranges from 5.8 to 6.2 and to study the effect of pH we acidified to the desired value with HCl or citric acid. We were particularly interested in citric acid since it will be recovered by ion exchange and hence, it may be possible to recycle some of it in the completed process. This possibility must be considered in the optimization studies we plan to make.

Our studies revealed that with protein water containing 1.5 percent soluble solids the percentage of protein precipitated increased from 63 percent at pH of 6.0 to 87 percent when the pH was lowered to 2.0; when protein water containing 2.8 percent soluble solids was used, the percentage increased from 70 percent at a pH of 6 to 90 percent at a pH of 3.0. In addition to the obvious increase caused by acidification, we can see that increasing the solids content increased the percentage coagulated. A subsequent experiment in which the pH of the protein water was 5.8 revealed that 70 percent precipitated with 1.5 percent protein water, increasing to 75 percent with 2.8 percent protein water and up to 85 percent with 4.0 percent protein water.

Since proteins are natural polyelectrolytes, there arose the question whether anything else settled with the precipitated protein. We were especially concerned about the amino acids. Carefully made material balances revealed that 90 to 100 percent of the amino compounds remained in the supernatant liquid and did not come down with the precipitate. The same studies showed that the precipitate contained 50 to 60 percent proteins. As yet the identity of the other 40 percent is unknown as well as how it affects the utility of the precipitate other than its use as feed. However, these problems are being studied.

Probably the most important question to be answered was how much residual protein could be tolerated without fouling the ion-exchange column. We found that a protein content as low as 300 p.p.m. caused some precipitation in the column while 430 p.p.m. seriously interfered with column operation. The ion-exchange column only performed trouble free when the residual protein was 180 p.p.m. Since the protein water contains 1,500 to 4,000 p.p.m. of protein, it is obvious that the coagulation and separation must be virtually complete.

These studies enabled us to evaluate settling as a potential solid-liquid separation method (table 1). However, we concluded that it was inadequate for our purposes. The separation was not sufficiently sharp; the supernatants often were quite hazy or contained floating solids. We found that we could settle out the haze and the floaters by letting the slurries stand for 12 hours or more at 38° F. but this is hardly feasible for a commercial operation recovering all the valuables. If we were just concerned with recovering proteins followed by conventional biological treatment, settling might be practical. However, the slurries were quite dilute (1.3 to 3.5 percent) and required further dewatering before they could be dehydrated. Therefore, we investigated filtration as an alternative to gravity settling.

Table 1.--Results of settling tests

Amino acids	not adsorbed by precipitate
Protein content of precipitate	50 - 60 percent
Separation	not sharp enough for ion-exchange columns, supernatants are hazy.[1]
Slurries	1.3 to 3.5 percent solids - too thin for air, drum or freeze drying; need further dewatering

[1] Removable by standing 12 hours or more at 38° F.

We used a plate- and frame-filter press to filter the slurries and again we observed the beneficial effect of acidification (table 2). At a pH of 5.8 we could filter the slurries readily in the range 70° to 180° F., obtaining

Table 2.--Filtration studies

	pH	
	3.0 to 4.0	5.8
Percent protein remaining in filtrate	trace	25
Turbity of filtrates	sparkling clear yellow	sparkling clear amber
Effective temp. range	70°to 180° F.	70°to 180° F.
Cod removal		
slurry	18,113 mg./ℓ.	
filtrate	11,754 mg./ℓ.	
percent removed	35	

sparkling clear filtrates. However, they still contained 25 percent of the proteins originally present. Those slurries prepared in the pH range 3.0 to 4.0 filtered readily and the filtrates contained only a trace of the original protein. Use of a supercentrifuge with the same slurries gave similar results. A rotary vacuum filter, commonly employed in potato operations is also under study.

Another point of interest is the amount of COD reduction brought about when all the proteins are removed. We found that this reduced the COD from 18,113 mg./l. to 11,754, a reduction of 35 percent.

After filtration and centrifugation we tried three drying methods: (1) Air drying; (2) drum drying; and (3) freeze drying. Air drying in a conventional tray drier gave a dried product which was black, hard and hornlike, and difficult to grind. However, we found that drum drying (3 r.p.m., 25 to 35 p.s.i.g. steam and 0.008 inch clearance) gave a fairly soft tan product. Freeze drying gave a white soft product; however, this method is probably too expensive. Use of the drum dryer requires feeds containing 12 to 15 percent solids to get a good sheet. We found that after centrifugation the solids content ranged from 25 to 35 percent solids and we had to dilute before we could drum dry them. However, filtration gave slurries in the 12 to 15 percent solids range.

What remains to be done? Based on the results obtained thus far, we plan to build a small integrated pilot plant which will permit us to optimize the process and to estimate costs while we are producing enough material for evaluation. In the form in which we have recovered the proteins, they can be sold as animal feed as is currently done in Europe. Incidentally, these proteins command a higher price than soy proteins because of their nutritional superiority. But the possibility of finding higher value uses must not be overlooked. Already chemists in our potato investigations group have begun investigating the precipitate to determine the composition of the nonprotein portion, the extent of protein denaturation, the solubility and dispersibility of the protein, and the identification of the individual proteins and their amino acid composition. Such knowledge is indispensable for fully assessing the potential of the protein product we can now recover from starch factory effluents. Other ways of improving product quality will also be investigated. For example, recent studies on leaf protein have shown that a better dried product can be produced by two-stage drying instead of one. Fish proteins have been solubilized by sodium hydroxide, thus extending the range of functional uses. Oil seed proteins have been solubilized by sodium hydroxide or ortho phosphoric acid. Perhaps these or similar methods can be found that may give us more versatile products demanding higher prices.

REUSE OF WATER AND RECLAMATION OF NUTRIENTS FROM POTATO-CUTTING WASTES

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Potato-processing plants are major contributors to water-borne pollution. At Western Utilization we have divided our studies in water pollution from potato processing into three major inplant pollution-producing operations, namely: peeling, cutting, and blanching (leaching). Of these, conventional peeling contributes the greatest part. It was here that the initial effort was made, and the process known as "Dry Caustic Peeling" was the result. Dry Caustic Peeling, as compared with conventional methods of peeling, can keep 75-80 percent of the total plant-generated waste from reaching streams or sewage treatment facilities. The next area of importance to us in the quantity of biodegradable materials produced, is the cutting operation. This paper describes work done in this area.

The amount of material washed from potato pieces is roughly proportional to the amount of new surface exposed by cutting. In an experimental study of different types of cut products, (strips, slices, dice) we found the weight losses highest for potato chips (at nearly 12 percent) and lowest for half-inch fries (approximately 3 percent). The waste water from this operation is very high in biodegradable materials. Ponding of the effluent results in serious odor problems, and secondary treatment is expensive. The soluble solids are so diluted by the large quantities of water used in the cutting and washing operation that recovery is not now economical. Therefore, we felt, as with the peeling operation, that concentrating the soluble solids by reducing the quantity of water used, would reduce problems of disposal; and could lead to economical recovery. Recycling of the wash water was investigated.

Starch, in the form of insoluble granules, constitutes more than half of the material that can be recovered from the wash water. Procedures for its removal from waste water are readily available. In the experimental water recycling system used, the supernatant liquid over the rapidly settled starch granules was continuously pumped off for recycling. Small starch granules and other insoluble solids, suspended in the wash water, were removed by a roughing filter, either a Sharple's continuous centrifuge or an experimental Uniflow filter now being tested in our laboratory. Some problems have been experienced with plugging of the Uniflow filters but many different materials for the construction of the filter are yet to be investigated and studies are continuing. The centrifuge worked satisfactorily.

After the large insoluble particulates were removed, the clarified wash water containing the soluble solids was pumped through a finishing filter precoated with diatomaceous earth. This filter removed the remaining fine particles and reduced bacterial contamination. From this filter the wash water was returned to the slice washer. A low level of sodium sulfite was kept in the wash water to prevent oxidation and enzymatic discoloration of the recycled water.

On successive cycles the concentration of soluble solids in the wash water increases toward the concentration of filtered undiluted potato juice. Samples of recycled wash water were taken at intervals to determine the rate of concentration of the soluble solids. Extrapolation of the experimental data showed that if the wash water were recycled to half the strength of undiluted potato juice, only 60-75 gallons of water would be required to wash the slices from one ton of peeled potatoes. A plant processing 100 tons of chips per day would have a total wash water volume of less than 10,000 gallons. Since less material is lost in cutting french fries or dice, the quantity of water required in either of these operations would be even less.

Further concentration of the recycled wash water was carried out by two means. A pilot plant vacuum flash evaporator, similar to the type used in sugar production, achieved a twelvefold concentration on a single pass with an input rate of 60 gallons per hour. There are many types of evaporators well suited to this operation. Similar concentrations of the soluble solids were obtained by an experimental reverse osmosis apparatus, but at a much slower rate. This twelvefold concentrate contains about 20 percent solids. It might be used after treatment, as an animal feed or as a food additive for human consumption.

After freeze drying, the wash water residue was found to contain many, if not all, of the flavor constituents of raw potato. Sensory appraisal panels are being run to determine the desirability of potato flavor enhancement in potato-containing products, as well as the possibilities of protein fortification of potato, grain, and vegetable products.

Analysis of the dried solids showed it to be 40-50 percent protein with smaller amounts of carbohydrates and free amino acids. The protein fraction proved to be well balanced with respect to the essential amino acids. Animal-feeding trials are now underway to determine the protein efficiency ratio of the recovered solids. If food, chemical, or biological uses for the products recovered from waste-cutting water could be found, additional processing costs associated with recycling could be offset.

This study, to date, has not attempted to determine the best or most economical equipment for use in water recycling. However, fundamental information about the amount and type of waste material generated in the cutting operation indicates that the amount of water used could be substantially reduced, and that the concentrated waste product has potential as a food-fortification product.

NEW DEVELOPMENTS IN EXTRUDED POTATOES

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Summary

Extruded french-fried potatoes prepared from a reconstituted dry mix have been used for many years in this country and in Europe. The advantages of such a product in space, transportation, and convenience are obvious.

Recently, flavored extruded potato products have been developed. Dry flavoring ingredients are added to the dry mix and reconstituted with water. Flavors presently available are taco, cheese, barbeque, chili, pizza, and onion-garlic.

The flavored potato product may be extruded not only in the conventional french-fry form but in a variety of shapes and sizes.

Our marketing program is aimed in two directions. First producing a par-fried, flavored, extruded potato product to be distributed either under refrigeration or frozen. The finish-frying will take place in the food service institution. Second is the use of dry mix at the place of service using recently improved extruded equipment. Cooking times after extrusion are very rapid, that is, 60-90 seconds.

Investigations are now under way utilizing texturized soy-protein products in conjunction with the potato mix. Such products should have unique applications in nutritive value and texture.

EFFECT OF HOLDING TIME OF THAWED FROZEN POTATOES ON FAT ABSORPTION

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At the Seventeenth National Potato Utilization Conference, we reported that frozen french-fried potatoes (par-fries) that had been held in the thawed state lost more moisture and absorbed more fat during finish-frying than did controls which had been thawed and immediately finish-fried. We speculated that the change taking place in the thawed strips during the holding period might be in some way related to retrogradation of the starch component. The present study was undertaken to test that hypothesis by measuring the effects of time and temperature of holding on fat-absorbing capacity and on starch retrogradation in par-fried potatoes.

A single lot of commercial frozen par-fries 7/16 in. square was used. Samples were quickly thawed and adjusted to the desired holding temperature (32°, 40°, or 50° F.). After the desired holding period (1.5, 5, or 72 hours), the samples were fried for 2.25 minutes in vegetable oil at 375° F. and refrozen in powdered dry ice. Control samples were merely thawed, immediately finish-fried, and refrozen. Subsequently all samples were weighed, freeze-dried, weighed again, ground, and analyzed for moisture and crude fat. The experiment was replicated four times.

For the starch retrogradation study par-fries were ground in the frozen state and small samples of the resulting powder were packed into precooled (-20° F.) conical centrifuge tubes. Each sample was then quickly thawed, adjusted to the selected holding temperature, held for the appropriate time, and then refrozen in dry ice. All samples were later freeze-dried and defatted with petroleum ether. A portion of each sample was blended with 2,000 times its weight of water and centrifuged to throw down insoluble starch and other constituents. Soluble starch was measured by mixing 1.0 ml. of the supernatant with 10 ml. of dilute Lugol's solution (0.10 g. I2 and 0.20 g. KI per liter) and measuring the absorbance at 605 nm. in a spectrophotometer.

Results of the frying study are given in table 1. A substantial loss in yield of finish-fried product can be noted in as little as 1 1/2 hours at 50° F. or 5 hours at 40°. After 72 hours at 50° the loss is such that 7 percent more par-fries are needed to provide a given size serving than if they were not held in the defrosted state. It is apparent that the loss in yield is due to the greater loss of moisture from the par-fries that had been thawed and held. There is also a trend toward increased fat absorption with holding time. The greatest increase in fat absorption was about 25 percent over that of the control.

It should be noted that the change which resulted in greater loss of moisture, decreased yield, and increased fat absorption proceeds faster the higher the temperature.

Table 2 gives the results of the retrogradation study. As we had expected from an earlier study by Dr. A. L. Potter, who worked with partially dried potato cells, at 50° F. the time course of starch retrogradation in par-fries turned out to be similar to that of the change affecting moisture loss, yield, and fat absorption. It was this similarity which had originally suggested to us that the phenomena were causally related. However, table 2 shows that in par-fries, as in other starch-water systems, retrogradation proceeds faster the lower the temperature in the temperature range here considered.

It thus appears that although starch retrogradation and a change leading to increased moisture loss and fat absorption in finish-frying go on simultaneously when par-fries are held in the thawed state, the two phenomena are not causally related.

An alternative hypothesis, which remains to be tested, is as follows: During par-frying roughly a quarter of the moisture in a potato strip is driven off from the surface layers. The resulting steep moisture gradient between the center and the outside of the strip is preserved if the strip is promptly frozen. If later the strip is held in the thawed state, moisture will diffuse from the center to the outer layers. It is not unreasonable to assume that with more moisture in the outer parts of the strip more moisture will be lost under given conditions of finish-frying and that this will create more voids for the absorption of fat. Unlike retrogradation of starch, diffusion of moisture proceeds faster the higher the temperature.

In the frying experiments the controls were first thawed and then finish-fried. This is contrary to recommended practice, which is to fry from the frozen state. If the controls had been fried under the same conditions as the experimental samples but starting at a temperature of, say, 0° F., they would have received a less effective cook because of their lower initial heat content. Furthermore, there is no combination of time and temperature for frying par-fries from the frozen state which is equivalent in all respects to a given combination for frying them from the thawed state.

Table 1.--Effects of holding par-fries in the thawed state on behavior during finish-drying

Holding temperature (°F) and holding time	Yield (g./100 g.)	Moisture loss (g./100 g.)	Fat uptake (g./100 g.)
Not Held	79.0	23.0	1.8
32°: 1.5 hours	78.8	23.4	2.0
5 hours	78.5	23.8	1.9
72 hours	76.3	25.4	2.0
40°: 1.5 hours	77.0	24.7	1.8
5 hours	75.5	26.3	1.9
72 hours	74.8	27.4	2.1
50°: 1.5 hours	75.6	26.4	2.0
5 hours	74.8	27.1	2.0
72 hours	73.6	28.6	2.3

Table 2.--Effect of holding par-fries in the thawed state on retrogradation (loss of solubility) of starch

Holding temperature (°F) and holding time		*Absorbance at 605 nm.
Not held		.54
32°:	0.25 hour	.34
	.5 hour	.28
	1.0 hour	.20
	1.5 hours	.16
	5 hours	.08
	72 hours	.01
40°:	.5 hour	.30
	1.0 hour	.24
	1.5 hours	.20
	5 hours	.11
	72 hours	.02
50°:	.5 hour	.38
	1.0 hour	.33
	1.5 hours	.27
	5 hours	.17
	72 hours	.03

* Decreasing absorbance corresponds to increasing retrogradation. See text for details.

VITAMIN FORTIFICATION OF DEHYDRATED POTATO PRODUCTS

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Addition of vitamins to various food products has been a commercial practice for over 25 years. During that time, it has gradually evolved from a system to replace nutrients lost in processing to a system of supplying needed nutrients to the diet as well.

As you probably know, the dehydrated potato industry has recently been involved in two fortification programs. The first of these is the production of vitamin A and C fortified flakes and granules which are purchased by USDA for the commodity distribution program. In addition, some producers also manufacture vitamin C fortified products for school lunch programs. I will therefore devote most of this discussion to these two vitamins and to some of the problems involved in adding them to potato flakes and granules.

Vitamin C (ascorbic acid) is one of the water-soluble vitamins and occurs naturally in potatoes. Potatoes actually contribute a significant amount of vitamin C to the average diet because of the quantity in which they are consumed. In the pure, dry, crystalline form, ascorbic acid is very stable. In solution, however, or in the presence of moisture, vitamin C is easily oxidized. The rate of oxidation is accelerated at higher temperatures and in the presence of trace amounts of metals such as copper or iron.

Vitamin A is one of the fat-soluble vitamins and is relatively unstable in the pure form due to oxidation. Stabilized dry products have been developed therefore in which the vitamin A is dispersed in a gelatin or gum matrix in order to protect it from oxygen. This form of vitamin A supplement is particularly useful in dry mixes, powders, and tablets. Once the matrix is destroyed (usually by dissolving in water), the stability characteristics of the product are lost. Vitamin A is also sold as a standardized solution in oil.

The stability of added vitamins A and C in dehydrated potatoes is mainly dependent on how the vitamins are added. In potato granules, the vitamins can be added by dry-blending with the finished granules. The dry stabilized vitamin A products which are used do not lose their integrity in this blend and the moisture level of the granules is low enough not to adversely affect the vitamin C stability. Stability of the two vitamins in this product is therefore very good as is shown in table 1. The only problem in fortifying granules is to insure blend uniformity. This can be done by proper selection of raw materials and by proper preblending.

Table 1.--Stability of vitamins A and C in dehydrated potato granules

Item	Air-pack can	Flexible package
Vitamin A (units/oz)		
Initial	3800	3400
12 months at 70°F	3220	3160
12 months at 100°F	2700	2735
Vitamin C (mg/oz)		
Initial	61.2	62.8
12 months at 70°F	54.2	47.0
12 months at 100°F	57.0	48.5

The fortification of potato flakes is much more complex. Several methods of addition have been tried and all of them have shortcomings. Dry addition to the finished flakes would, of course, be the best method from a stability standpoint but uniform distribution of the vitamins is a problem. The amount added constitutes only about 0.2 percent of the total product. Not only is this level difficult to distribute uniformly, but the vitamins may classify after the flakes are packaged.

Most of the flake fortification has been done by adding the vitamins to the mash prior to drum drying. Vitamin C is soluble and vitamin A is dispersible in the monoglyceride dispersion which is normally added to the mash at this point. Since this operation is continuous, the rate at which the vitamins are metered into the mash must be carefully controlled according to the rate at which the driers are operating. The vitamin loss during drying is quite high and subsequent stability losses in the finished product are also higher since the vitamins are distributed over a large surface area and the vitamin A is no longer present in a stabilized form.

Table 2 presents some of the data obtained by Cording and coworkers at the USDA Eastern Regional Research Laboratory.

Table 2.--Stability of vitamins A and C in fortified potato flakes

Item	Air-pack can	Nitrogen-pack can
Vitamin A (units/3 oz)		
Initial	10,900	10,900
28 weeks at 75°F	7,420	10,600
Vitamin C (mg./3 oz)		
Initial	90	90
28 weeks at 75°F	68.5	87

Source: Cording and others. Vitamin Stability in Fortified Potato Flakes, Food Technol. 15: 279-282, 1961.

Comparing the results obtained in nitrogen-pack cans with those obtained in air-pack cans shows that oxidation is the primary factor in vitamins A and C instability. Since this work was done in pilot equipment, the drying losses were much less than what is experienced in commercial practice. About 30 percent of the vitamin C and 10 percent of the vitamin A was lost during drying in this study. In commercial trials it has been our experience that about 50 percent of the vitamin C and 30 percent of the vitamin A is lost during drying.

Table 3 summarizes the results of a typical stability study conducted by our laboratories in cooperation with a commercial producer. This study was done on flakes produced for USDA contract and was initiated when the vitamin A specification was 2,500 units per ounce. The theoretical level of vitamin addition to the mash was 4,800 units vitamin A and 120 milligrams vitamin C per ounce of potatoes (finished-weight basis). You can see from the results that the drying losses encountered were quite high. Furthermore, the stability losses in the finished product are also high probably because the polyethylene package is relatively permeable to air. After 6-months storage, only 40 percent of the initial vitamin A and 50 percent of the initial vitamin C level were retained in the product. It is therefore obvious why the flake producers are looking for alternate methods of vitamin addition.

Table 3.--Stability of vitamins A and C in fortified potato flakes[1]

Assay period	Vitamin A (units/oz)	Vitamin C (units/oz)
Initial	3,435	58.3
2 weeks	3,250	53.3
6 weeks	2,350	44.5
12 weeks	1,935	40.6
6 months	1,410	30.1

[1] Packaging - Polyethylene bags (1 lb net); storage - Room temperature (75° F).

Spraying of a water solution or emulsion of the vitamins onto the finished flakes has also been investigated. This process would eliminate the drying losses encountered in the mash addition process but would still result in relatively poor storage stability unless the product was packed in an inert atmosphere. Nonuniform application of the vitamins is also a problem here. Localized concentration of vitamin C usually results in pink discoloration of the flakes on storage. In fact, this pink discoloration has sometimes been encountered in flakes where the vitamin C was added in the mash. At this time the exact mechanism of this discoloration is not known.

Limited studies have also been conducted on the fortification of dehydrated potatoes with B vitamins (thiamin, riboflavin, and niacin). These vitamins are more stable overall than vitamins A and C. Results obtained by Cording and coworkers in potato flakes are summarized in table 4.

Table 4.--Stability of B vitamins in fortified potato flakes

Item	Air-pack can	Nitrogen-pack can
Niacin (mg/3 oz)		
Initial	23.2	23.2
28 weeks at 75° F	21.3	21.3
Riboflavin (mg/3 oz)		
Initial	2.58	2.48
28 weeks at 75° F	2.41	2.31
Thiamin (mg/3 oz)		
Initial	1.52	1.52
28 weeks at 75° F	1.51	1.60

Source: Cording, and others. Vitamin Stability in Fortified Potato Flakes, Food Technol. 15: 279-282, 1961.

As can be seen from the data, stability of the B vitamins in the finished product is excellent. In this study the vitamins were added to the mash prior to drying. Drying losses were low for riboflavin (14 percent) and niacin (6 percent) but were high for thiamin (approximately 50 percent). This is not unexpected since thiamin is sensitive to strong reducing agents. The high drying loss was probably caused by reaction with the sulfite added to the mash and shows that this procedure would not be recommended for commercial practice.

Studies on fortification of granules with B vitamins have shown that addition by dry blending is feasible and that stability in the finished product is excellent. Any evaluation of B vitamins, however, should consider the possibility of undesirable flavor produced by thiamin, riboflavin, and niacin and the possibility of undesirable color resulting from the use of riboflavin. These adverse effects can usually be controlled by fortifying at lower levels.

I hope that I have given you, in the past few minutes, a very brief view of the state of vitamin fortification in the potato industry and some of the problems associated with it. With the current interest in fortification programs, I am sure there will be even greater efforts in the next few years to overcome these problems and that fortification will be expanded to include other products and other nutrients.

THE SCHOOL LUNCH PROGRAM IN TODAY'S WORLD

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Among all of you I am the school lunch expert.....at least that is what I would like to believe. What is the story about lunches for school children? I have just returned from a 4,700 miles vacation and 5 days on a ferry and contrary to the sign that says "everybody needs milk" I became convinced that everybody eats potatoes. From the lush fields of Bakersfield to the backyard plots of rural northern British Columbia, I saw potato plants.....destined to become a part of the total potato consumption that results in an increasing amount each year per capita.....this statistic, I am sure, has already been projected many times during this conference. To us in school feeding, the potato serves many roles--a merchandiser, a filler-upper, a point of communication because of its widespread versatility and recognition.

There is a historical significance to the noonmeal at school.....whether it be social over the decorated rectangle box that I carried every day of my life to a rural school in southern Oregon (it wasn't socially unacceptable then to be seen carrying a lunchbox) or the economic one that denies an inner-city youngster the opportunity for adequate nutrition that might mean the difference between mental awareness or social rejection. In the early 1800's the reforms of the industrial revolution freed large numbers of children from the labor force, and in the United States this public concern brought about low-cost school lunches to promote attendance and health. We have failed. This need still exists today.

Should this be the start of "pay now and save later" philosophy? Interpreted, this refers to providing good nutrition when it is needed, whether it be in the young years or the "sunset years" and a wise investment in the youth of today will save money for all of us in the years ahead. Feed them in the schools of today and not in the institutions of correction tomorrow. France assumed responsibility beyond that of the home in 1840 and in 1853 New York Childrens Aid Society realized that there was a need to supplement the role of the home. The need continues into 1970. And we have not met this need when figures from recruitment for war reveals the need for improved nutrition, young men rejected for reasons directly related to faulty nutrition. Must we continue to fail to meet the needs in this most affluent of all nations? A living body is not a fixed thing but a flowing event, like a flame or a whirlpool.

The popular clichè about "nothing says lovin' like something from the oven" is so true.....food is the security blanket of the world and without this security revolutions of many proportions arise. Lin Yutang said that if a chicken has been killed and it is not cooked properly, that chicken has died in vain. My faith in human nature tells me that our very nerves will force us to realize that there can be no taste at the table without love in the kitchen. We must return to the security of a family around a table instead of each in his individual pursuits with a TV tray in front of the "boob tube." Is this our basis for our poor nutritional habits? Allan Watts says "Life seems to be a system that eats itself to death and in which victory equals defeat."

History tells us the "why" of the past, but it rarely provides us with the "how" of the future. For this we look to experts like you. History has brought about the establishment of sanitation codes, the development of products to meet needs beyond our greatest expectations.

The two basic historical considerations are:

1. Continuous evolution of social consciousness which demands that all children be developed physically and mentally so that they have the opportunity to make a contribution to society rather than become a burden on it.

2. The economic necessity of controlling the market for agricultural products.

LET'S TAKE SCHOOL LUNCH COMMODITIES OUT OF THE POLITICAL FOOTBALL ARENA. WE ARE BIG BUSINESS.....next to the Army the biggest single-feeding operation in the world .....but we can't project budgets, plan personnel, because we don't know what needs to be subsidized for agricultural interests and so we become the garbage can for products that are in overabundance and need to be price maintained. We realize the need for such concern, but let's show us a little more consideration in the plotting of our MO. All of you seek help from the extension people, key research specialists, the weatherman, the "water witcher" but we "hang fire" until the day before school opens and then hope for the best. A hungry child doesn't care if legislation is signed by a Democrat or Republican.

The projections for the future are BIG, but where the dollars are coming from is anyone's guess. We have received much publicity about feeding everyone, a school lunch for all, regardless of financial need, by 1975. In 1970 California will daily serve 855,000 complete lunches and 1½ million half-pints of milk. Lots of words have been written, but the funds are locked in a chest surrounded securely by red tape. Stipulations for the use of the money often eliminate the eligibility for districts and to use even restricted funds becomes financially ludicrous.....as long as a school lunch program must be self-supporting, taking no money from general funds. Football fields cater to the needs of a few, parking lots are supplied for those that can afford it.....the greatest segregation segment of our school-day remains the school lunch, separating the have money from the have not. Let's make eating at school an educational experience almost as important as the lead in the opera or the fastest typist.

Much has been said that today's youth will grow into adulthood in the generations ahead without legs or teeth. No teenager's life is complete without wheels beneath him and the automatic action of shoving food into his face. This is the really convenience food--food that is easily acquired, food that required no time for chewing, and that is completely incapable of interfering with any other activity at that time. The franchises have made this food convenient, and our affluent society has provided the medium of exchange but, fortunately, people like you and me are concerned about the nutrition of this eating-out-of-hand generation. Thank you for adding vitamin C to our potato granules. I'm confident my nutrition professor of several decades ago would have thought us all slightly "teched" if we would even have written a menu depending upon potatoes as a major source of vitamin C.

During this conference I'm confident that you have been made aware that this generation is not "marching on its tummy" but often sliding to the beach on a french fry with a handful of potato chips. The middle-aged group is discovering a whole new concept of menu selection (and aided by the onslaught of new food franchises) about something referred to as fish and chips. What a market an old favorite became with the addition of malt vinegar! Our older counterparts look to cream of potato soup, baked potato, mashed potatoes and gravy as food for sustenance, for comfort, and denture proof! We know the impact of television on the noisiest potato chip in town, but what advertising agency would dare to dwell upon a campaign expounding the silent qualities of a mashed potato granule?

Those of institutional feeding will, as I have said, eventually be meeting needs of all age groups. Will you as growers, fabricators, and brokers tell us the truth, listen to our needs, standardize your packaging, and send enlightened people to tell us the attributes of your research?

We are told that soon the schools will assume a responsibility that literally covers the "womb to the tomb" for on one hand we prepare for preschool feeding and on the other to care for those too old to leave their homes or to provide adequate food for themselves. We are ready; we are capable; we have the facilities; we are dedicated; we smile.....just legislate the dollars and we will be delighted to show the job we can do.

NUTRITION AS A MARKETING TOOL FOR POTATOES

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When I told a professional acquaintance that I was preparing a talk on the subject "Nutrition as a Marketing Tool for Potatoes," he broke into a chuckle. Theorists of humor say we laugh at the incongruous, the unexpected. I suppose it would be less amusing to speak on nutrition as a marketing tool for milk or for oranges, because "everyone knows," we say, that milk and oranges are nutritious foods and that they are "good for you." On the other hand, I submit that there is no such widespread image of potatoes as a highly nutritious food, particularly in association with any single nutrient.

Can a nutritional case be made for potatoes? If so, can it be impressed upon the consuming public so as to increase their use of potatoes? As a hint to my answer I will throw out two key words: "need" and "acceptance." Keep these words in mind as this presentation unfolds, and at the close I hope you will see how these words are basic to answering the question implied in the title of my talk.

First of all, are diets of Americans in need of improvement? If so, what are the nutritional gaps? Second, can potatoes help fill these gaps? My remarks today will be addressed to these questions of need and to examining the nutritional attributes of potatoes as related to the value systems of consumers. The final question to be explored is, what are the potentials and limitations of marketing potatoes on the theme of nutrition?

How Satisfactory Are U. S. Diets?

The U.S. Department of Agriculture has conducted nationwide household food consumption surveys periodically since 1936. Subsequent surveys were made in 1942, 1948, 1955, and the most recent one, in a 12-month period during 1965-66. Although these surveys provide a wealth of useful marketing data on food use and money value, the basic objective has been, and continues to be, the evaluation of household diets, and for the first time in the most recent survey, the diets of individuals. Furthermore, by comparing the results from one survey to the next, trends and changes in the dietary situation can be detected.

Since the previous survey, in spring 1955, diets have declined in quality. In 1965, only 50 percent of the U.S. households had diets rated "good." That is, the nutritive content of their food met the Recommended Dietary Allowances (RDA's) for each of the seven nutrients studied. These evaluations were based upon the recommended allowances published in 1963 by the Food and Nutrition Board of the National Research Council-National Academy of Sciences. Ten years earlier 60 percent had good diets. Looking at it another way, the proportion of total households whose diets rated "poor", that is, those providing less than two-thirds of the RDA's for from one to seven of the nutrients, increased from 15 percent in 1955 to 21 percent, or one in five households, in 1965.

As you might expect, households with lower incomes had poorer diets. More than one in three households having incomes of less than $3,000 per year had poor diets in spring 1965. But money alone was no guarantee of a good diet. Even among those with annual incomes of $10,000 and over, 9 percent, or almost one in 10, had diets rated "poor."

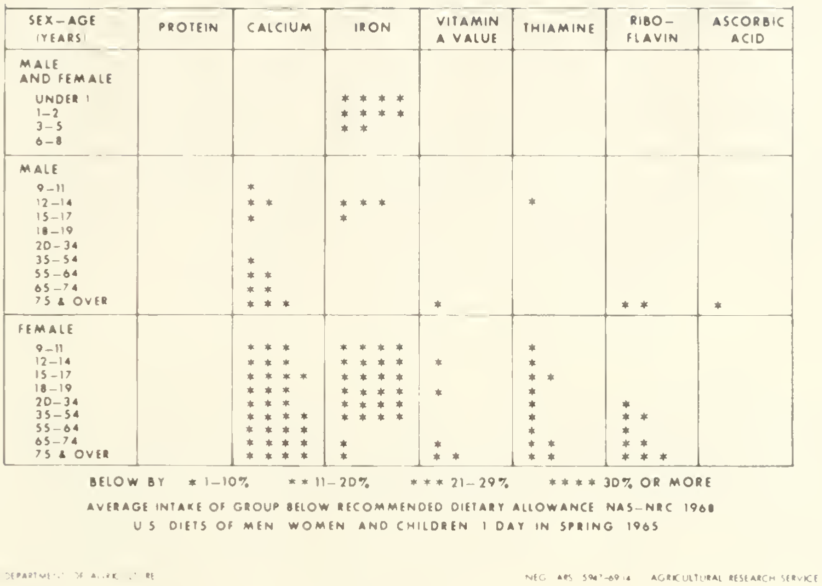
What Were the Problem Nutrients?

Household diets most often fell short from meeting the RDA's for calcium, ascorbic acid (vitamin C), and vitamin A. We consider a diet "poor" if it is below two-thirds of the RDA for a nutrient, and for ascorbic acid, 13 percent were below this level. Vitamin A ranked next, with 10 percent of the households having less than two-thirds of the RDA, followed by calcium, with 8 percent being below.

A special feature of the spring 1965 survey was the collection of information, by the recall method, on the one-day food intake of some 14,500 individual men, women, and children in the survey households. For the analysis of these data, averages were calculated for 22 sex-age groups as established by the National Research Council for the publication of the Recommended Dietary Allowances.

Diets of females fell shorter from meeting the allowances than those of males (fig. 1). Furthermore, the nutrients most often below the RDA's, and by the greatest degree, were calcium and iron. Children of both sexes under age 6 had diets which averaged below the RDA's only for iron, but by as much as 50 percent or more for infants and children under age 3.

But when we look at similar results for persons in low-income households, those with incomes under $3,000 per year, the dietary situation was somewhat worse (fig. 2). The nutrients which showed up as averaging considerably below the RDA's were ascorbic acid and vitamin A value. For the analysis



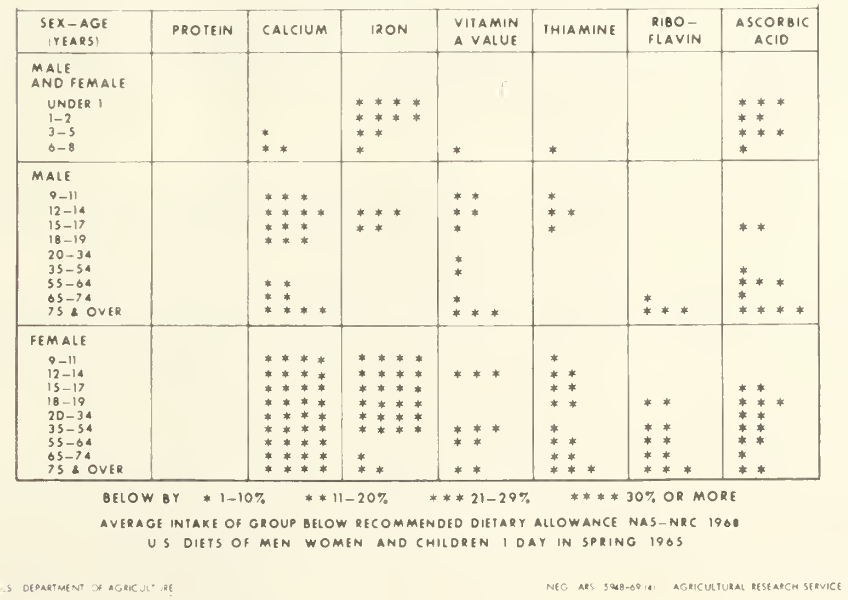
SEX–AGE (YEARS)	PROTEIN	CALCIUM	IRON	VITAMIN A VALUE	THIAMINE	RIBO–FLAVIN	ASCORBIC ACID
MALE AND FEMALE							
UNDER 1			* * * *				
1–2			* * * *				
3–5			* *				
6–8							
MALE							
9–11		*					
12–14		* *	* * *		*		
15–17		*	*				
18–19							
20–34							
35–54		*					
55–64		* *					
65–74		* *					
75 & OVER		* * *		*		* *	*
FEMALE							
9–11		* * *	* * * *		*		
12–14		* * *	* * * *	*	*		
15–17		* * * *	* * * *		* *		
18–19		* * *	* * * *	*	*		
20–34		* * *	* * * *		*	*	
35–54		* * * *	* * * *		*	* *	
55–64		* * * *			*	*	
65–74		* * * *	*	*	* *	* *	
75 & OVER		* * * *	*	* *	* *	* * *	

BELOW BY * 1–10% ** 11–20% *** 21–29% **** 30% OR MORE

AVERAGE INTAKE OF GROUP BELOW RECOMMENDED DIETARY ALLOWANCE NAS–NRC 1968
U S DIETS OF MEN WOMEN AND CHILDREN 1 DAY IN SPRING 1965

U.S. DEPARTMENT OF AGRICULTURE NEG. ARS 5947-69(4) AGRICULTURAL RESEARCH SERVICE

Figure 1.--Nutrient intake below recommended allowance.



SEX–AGE (YEARS)	PROTEIN	CALCIUM	IRON	VITAMIN A VALUE	THIAMINE	RIBO–FLAVIN	ASCORBIC ACID
MALE AND FEMALE							
UNDER 1			* * * *				* * *
1–2			* * * *				* *
3–5		*	* *				* * *
6–8		* *	*	*	*		*
MALE							
9–11		* * *		* *	*		
12–14		* * * *	* * *	* *	* *		
15–17		* * *	* *	*	*		* *
18–19		* * *					
20–34				*			
35–54				*			*
55–64		* *					* * *
65–74		* *		*		*	*
75 & OVER		* * * *		* * *		* * *	* * * *
FEMALE							
9–11		* * * *	* * * *		*		
12–14		* * * *	* * * *	* * *	* *		
15–17		* * * *	* * * *		* *		* *
18–19		* * * *	* * * *		* *	* *	* * *
20–34		* * * *	* * * *				* *
35–54		* * * *	* * * *	* * *	*	* *	* *
55–64		* * * *		* *	* *	* *	* *
65–74		* * * *	*		* *	* *	*
75 & OVER		* * * *	* *	* *	* * *	* * *	* *

BELOW BY * 1–10% ** 11–20% *** 21–29% **** 30% OR MORE

AVERAGE INTAKE OF GROUP BELOW RECOMMENDED DIETARY ALLOWANCE NAS–NRC 1968
U S DIETS OF MEN WOMEN AND CHILDREN 1 DAY IN SPRING 1965

U.S. DEPARTMENT OF AGRICULTURE NEG. ARS 5948-69(4) AGRICULTURAL RESEARCH SERVICE

Figure 2.--Nutrient intake below recommended allowance
In Households with incomes under $3,000.

of individual diets, the 1968 RDA's were utilized, because they had been released by the time this phase of the analysis was undertaken. Among the principal changes from the 1963 RDA's was the increase in the allowance for iron for a number of female age groups. Also, ascorbic acid allowances were reduced to some extent, but as we noted, this nutrient was still a problem for individuals in low-income households.

On the basis of these survey results, there is a need--one of the keywords I mentioned--for dietary improvement with respect to iron and calcium for many population groups, and for low-income people, also for ascorbic acid and vitamin A.

Can Potatoes Help Fill the Nutrient Gaps Indicated by These Surveys?

Those persons who have what you surely would consider an adverse image of potatoes--as a high carbohydrate, starchy, fattening food--would very likely answer "no." I know your industry has been much concerned about this unfortunate set of beliefs which many people have concerning potatoes. I noticed also, that a talk at last year's conference discussed that subject, among other things. But as a refresher, let's take a look at the principal nutrients in potatoes, as shown in Agricultural Handbook 8,"Composition of Foods." The nutrients contained in 100 grams, or about 3.5 ounces, of edible portion of raw potatoes include 20 mg. of ascorbic acid, or one-third of the daily allowance for a man of ages 20-34; one-tenth mg. of thiamine, or about 7 percent of his allowance; and six-tenths mg. of iron, or 6 percent of the man's RDA. By contrast, and possibly to the disappointment of those who think potatoes are very high in calories, 100 grams of raw potato contain 76 calories, and this amount is only about 3 percent of the RDA for food energy for a 20-34-year-old man.

For the first time, in the 1968 edition, the National Research Council also published RDA's for vitamin B_6. Food composition data are not as plentiful for this vitamin as for some other nutrients, but our Division recently issued a research report which indicates that 100 grams of raw potato contain 0.25 mg. of B_6. By comparison, the same quantity in other notable sources of vitamin C, such as raw tomato contains only 0.10 mg. of vitamin B_6, and fresh orange, only 0.06 mg.

Bear in mind, these nutrient composition values I have given are for raw potatoes. The nutrient content varies according to the method of cooking or preparing raw potatoes, and also, it varies among the different forms of processed potatoes. For example, according to the most recent values available and published in Handbook 8, there is less vitamin C, on the average, in reconstituted dehydrated potatoes than in most forms of cooked fresh potatoes. It is recognized, of course, that values vary widely. The ascorbic acid level depends upon the time potatoes were stored until used fresh or processed, and upon the method of processing and length of storage of the dehydrated product.

In summary, then, we see that potatoes, while not contributing the major part of the daily allowance for some of the problem nutrients, nevertheless are a food which makes a significant contribution to meeting daily requirements for a number of nutrients, especially vitamin C. "In fact, a diet of whole milk and potatoes would supply almost all the food elements necessary for the maintenance of the human body." That statement is a direct quote from a new publication from the Agricultural Research Service entitled, "Toward the New: A Report on Better Foods and Nutrition from Agricultural Research." I recommend it to you as informative and interesting reading, particularly the chapter on "The Potato: Something Different These Days."

The nutritional importance of a particular food, such as potatoes, rests not merely on its nutrient composition, but also on the relative amount consumed. The very special merit of potatoes is that they are almost universally used and are widely accepted in American diets. In the 1965-66 nationwide survey we found that fresh white potatoes were used by 88 percent of the households in the winter season, and by almost the same proportion in the other seasons of the year, with summer usage being slightly lower, at 82 percent (table 1). The average quantity used per household in a week was 4.87 pounds for the year, but the quantity varied very little seasonally, from 4.67 pounds in summer to 5.08 pounds per household in fall.

Table 1.--Seasonal use of potato products[1/]
(% of households using in a week)

	Spring	Summer	Fall	Winter
Fresh	83.6	82.3	85.5	87.7
Chips, sticks	26.3	28.5	24.9	24.5
Frozen	11.6	11.6	10.9	10.7
Dehydrated	5.8	5.8	5.2	5.4
Canned	1.1	1.1	.8	1.4

[1/] USDA Nationwide Survey, 1965-66.

Frozen potatoes were used by 11.6 percent of the households in spring and summer, and again, there was very little seasonal variation, with winter usage only slightly lower, at 10.7 percent of households in a week. Of course, if these usage figures covered a longer period, as a month or year, they would show more households using potatoes. Dehydrated potatoes were used by 5.8 percent of the households in the spring and summer seasons. Potato chips and sticks also were used by a relatively large proportion of the households, by well over one-fourth of them, ranging from 24.5 percent in winter to 28.5 in summer.

Potatoes as an Economical Source of Nutrients

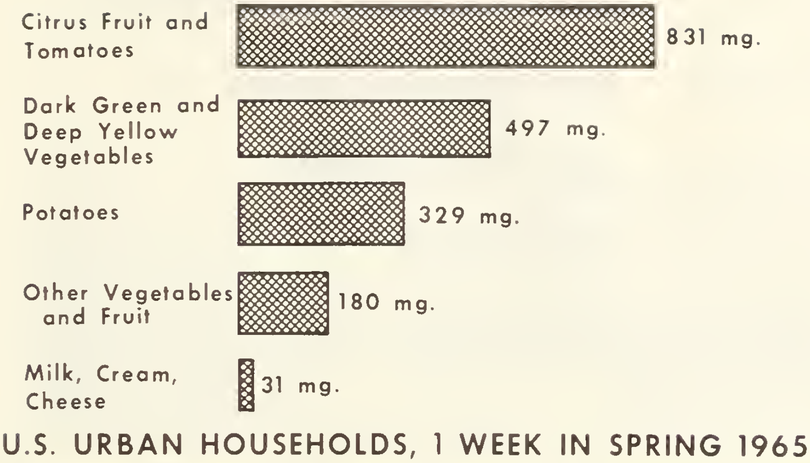
Not only are potatoes ingrained in the food patterns of our people, but they enjoy broad acceptance by families of all incomes. Some form or other of white potatoes were reported used in a week by 90 percent of the households in the spring survey, and they were used by about the same proportion of households in most income groups.

In these days of concern about inflation and food prices, homemakers are particularly anxious to stretch their food dollars. One way of answering the question as to whether potatoes can be marketed on a nutritional basis, is to note that potatoes are a "good buy" in terms of money spent for potatoes and nutrients obtained from them. Potatoes took only 2 1/2 cents of the food dollar spent by households in spring 1965, but they provided 10.1 percent of the ascorbic acid in the diets of these households, 5.8 percent of the niacin, 4.5 percent of the thiamine, 3.0 percent of the iron, 2.8 percent of the food energy, and 1.9 percent of the protein. In other words, they delivered relatively more nutrients than their modest "bite" into the food dollar--for five of the seven nutrients studied.

Another way to evaluate potatoes as a nutritional bargain is to see how much of the various nutrients can be obtained from a dollar's worth of potatoes as compared with other foods. Beginning with ascorbic acid, vitamin C, which is possibly one of the most promotable nutritional attributes of potatoes, we see that potatoes ranked third in terms of the amount of ascorbic acid obtained from a dollar's worth of food (fig. 3). Citrus fruit and tomatoes, combined, ranked first, followed by dark-green and deep-yellow vegetables.

But in terms of the ascorbic acid in the Nation's food supply, potatoes (along with sweetpotatoes) contribute almost the same proportion of total vitamin C as do citrus fruits and nearly twice as much as tomatoes (fig. 4). Over the long term, however, since 1909-13 citrus fruits have contributed a greater proportion, and potatoes, less. But it is important to note that the share of vitamin C contributed by potatoes has remained at about one-fifth of the total over the two decades since 1947-49.

Another nutrient which is increasingly recognized as a nutritional problem is iron, and here potatoes ranked fourth among the principal food groups in terms of amount of iron obtained from a dollar's worth of food (fig. 5). The legume group



U.S. URBAN HOUSEHOLDS, 1 WEEK IN SPRING 1965

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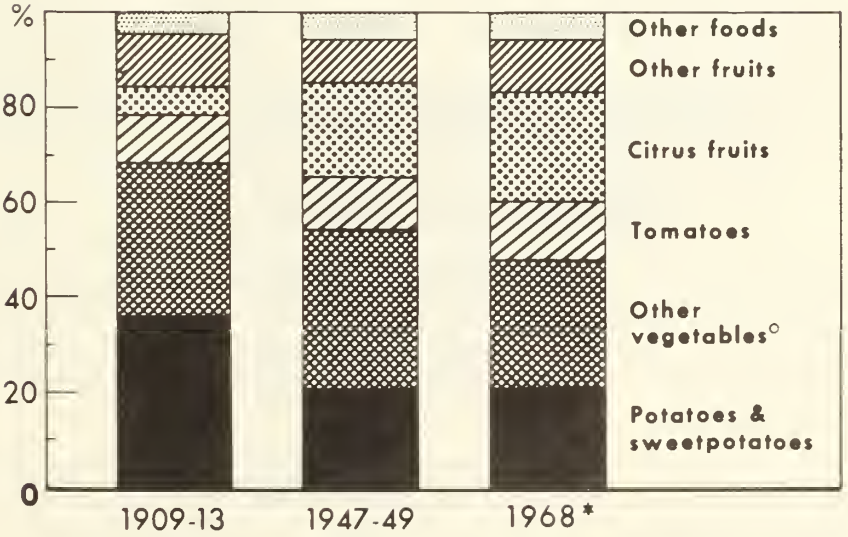
Figure 3.--Ascorbic acid from a dollar's worth of food.



*INCLUDES FORTIFICATION. 1968 DATA PRELIMINARY. °EXCLUDING TOMATOES, POTATOES & SWEETPOTATOES.

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Figure 4.--Sources of ascorbic acid.

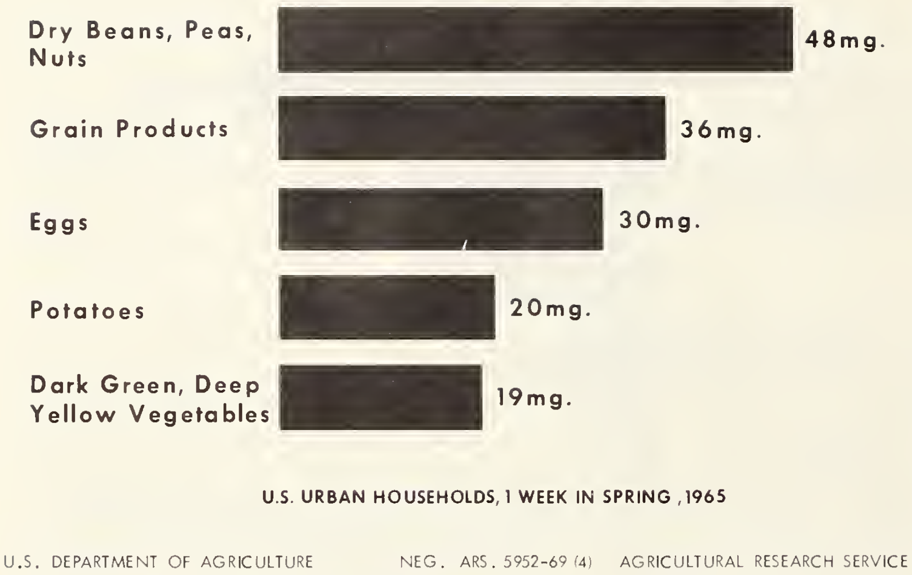


Figure 5.--Iron from a dollar's worth of food.

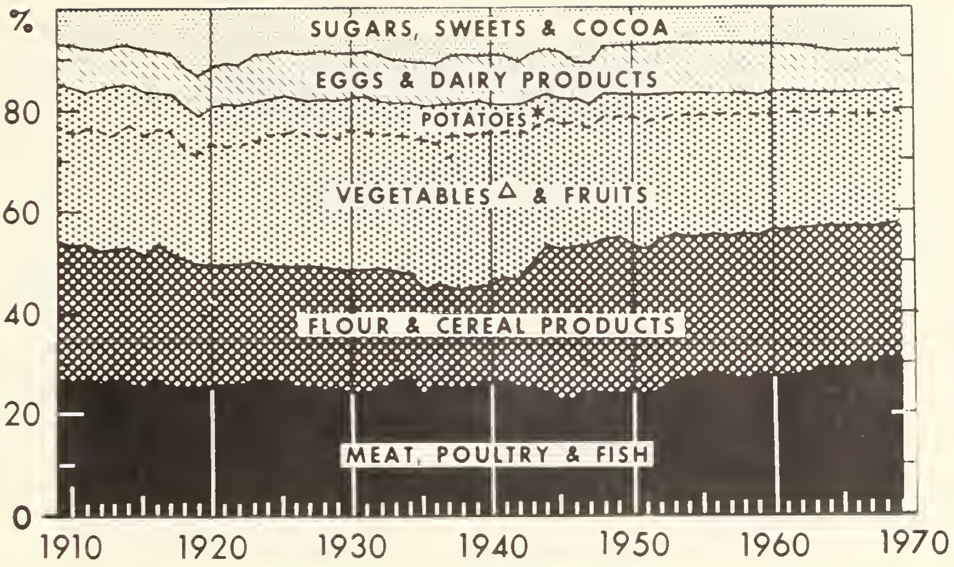
of dry beans, peas, and nuts ranked first, but these weren't used in quantities as great as potatoes.

True enough, potatoes are not a forerunner in terms of the proportion of total iron they provide in our food supply, but they do make a contribution, albeit a declining one, because the per capita consumption of potatoes has declined since 1910 (fig. 6). But I would venture to say that a surprisingly small number of people, if polled, would think that potatoes are a source of iron.

Potatoes rank third in contribution of thiamine from a dollar's worth of food, following grain products and the legume group (fig. 7). And surprisingly to some, perhaps, potatoes ranked fifth in terms of calories from a dollar's worth of food (fig. 8). The fats and oils group ranked first, with sugar and sweets second, as economical sources of calories.

According to some tentative estimates we have made for vitamin B_6, potatoes ranked first of all the principal food groups as an economical source of this vitamin (fig. 9).

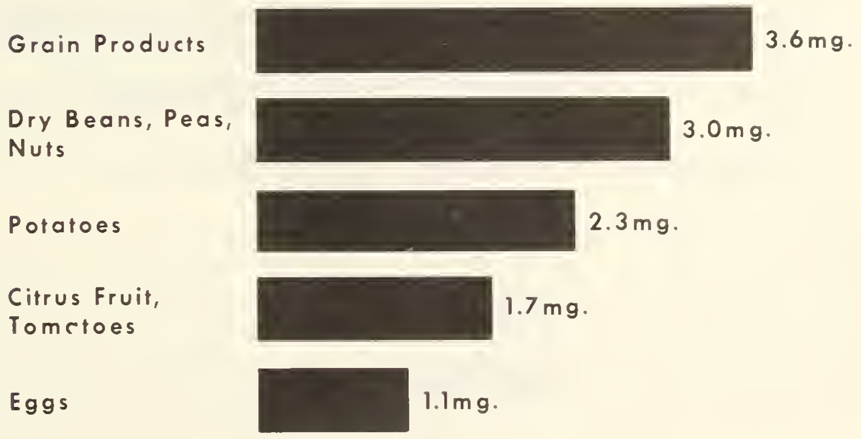
To recap, the fact that potatoes ranked fifth or better among food groups as an economical source of the five nutrients we have noted is meaningful for promotion. It suggests that potatoes could be featured as an economical nutrient "package."



PER CAPITA CIVILIAN FOOD SUPPLY. 1969 PRELIMINARY DATA.
* INCLUDES SWEETPOTATOES. △ INCLUDES DRY BEANS, PEAS, NUTS, SOYA PRODUCTS.

U.S. DEPARTMENT OF AGRICULTURE NEG. ARS 5977-69 (10) AGRICULTURAL RESEARCH SERVICE

Figure 6.--Sources of iron.



U.S. URBAN HOUSEHOLDS, 1 WEEK IN SPRING, 1965

U.S. DEPARTMENT OF AGRICULTURE NEG. ARS. 5953-69 (4) AGRICULTURAL RESEARCH SERVICE

Figure 7.--Thiamine from a dollar's worth of food.

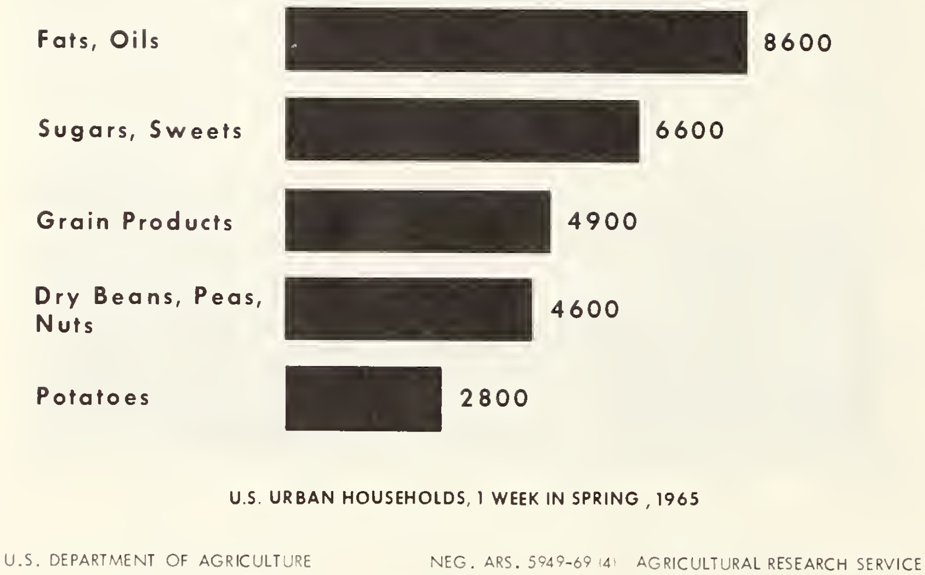


Figure 8.--Calories from a dollar's worth of food

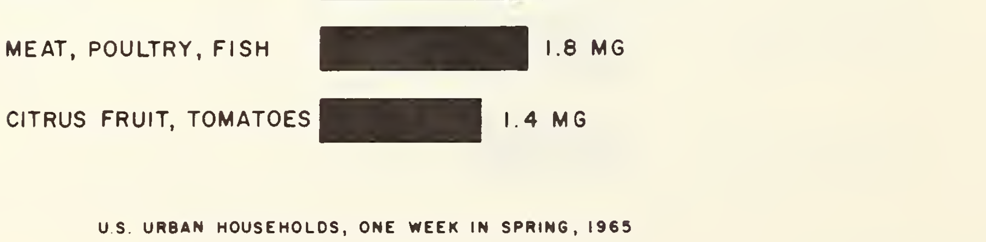


Figure 9.--Estimated vitamin B_6 from a dollar's worth of food.

Another angle on the special feature of potatoes as an economical source of nutrients was shown by the household survey data. We compared food usage in households that had good diets with those having poor diets, at different levels of food spending. Regardless how much households spent for food per person per week, those who had good diets used more white potatoes than did the families with poor diets. For example, among households that spent between $3 and $5 per person per week on food at home, families with good diets used an average of 2 pounds of white potatoes per week per person, but the ones with poor diets used only 1.3 pounds per person. But even in households who used as much as $12 to $16 worth of food at home per person in a week, an average of 2.6 pounds of potatoes were used per person by families with good diets as against only 1.8 pounds by those with poor diets. The consistently greater use of potatoes by the households with good diets, at each level of food spending, is striking and noteworthy.

Another finding from the survey of individual diets, which will no doubt surprise those who think of potatoes as a high-calorie food, is that they contributed only about 4 percent of the total food energy in one day's food. This is an approximation for the 22 sex-age groups. As a specific example, let's look at the source of calories for women between the ages of 20 and 34. I think we would agree that this is a weight and figure conscious group! They obtained an average of 4 percent of their calories from white potatoes, but 5 percent from beverages (other than milk and fruit juice), 5 percent from sugars and sweets, 6 percent from fats and oils, about 12 percent from milk and milk products, 26 percent from grain products, and 29 percent from meat, poultry, and fish. So, obviously, potatoes did not seem to be a caloric culprit in their diets.

Vitamin Fortification of Dehydrated Potatoes

The U.S. Department of Agriculture has been distributing dehydrated potatoes fortified with 800 mg. of vitamin C and 16,000 I.U. of vitamin A per pound to eligible needy families under the Commodity Distribution Program since 1968. Families are authorized one pound of the dehydrated product per person per month. This amount would provide about 54 percent of the daily Recommended Dietary Allowance of vitamin C for a family of four persons.

Additional vitamin C from other foods in the Commodity Distribution Program would enable families to obtain about 105 percent of the RDA. The vitamin A value provided by fortified dehydrated potatoes could provide 11.7 percent of the RDA.

These figures pertain to the quantities eligible households are authorized to receive. Officials in the Food and Nutrition Service informed me that the acceptance rate for fortified dehydrated potatoes has been running around 75 percent of the full quota of one pound per person per month. Considering that some households may not want the product, and at times there may be imperfections in product flow in the supply lines, this "take" rate is considered to be good. By comparison, families have been taking less than half of the nonfat dry milk allotment.

The total amount of dehydrated potatoes distributed has increased from 7.4 million pounds in fiscal year 1968 to 32.7 million pounds shipped in fiscal 1969, and 45.9 million pounds were purchased in fiscal 1970, some of which are still to be shipped. I was told, also, that the States have been very cooperative and that none of them have cut down on the quantities authorized by USDA.

The acceptance rate apparently has been satisfactory for these fortified dehydrated potatoes. Nevertheless, persons responsible for administering the program are keeping a watchful eye on the experience of users of the product. They are particularly anxious to hear any problems relating to deterioration in storage or problems of flavor, texture, color, and the like. It is recognized that the vitamin A fraction of the fortified product is especially likely to be troublesome, and whether or not it should continue to be included is currently under review.

Fortified dehydrated potatoes are also being used in the School Lunch Program. The approach here is somewhat different, however. In the Commodity Distribution Program, vitamin C is added to dehydrated potatoes as a vehicle for supplementing the level of vitamin C in family diets. But in the school lunch, vitamin C is added to restore to dehydrated potatoes approximately the same amount of vitamin C that is lost during the manufacturing process. Thus, these vitamin C-restored instant potatoes are eligible to be included in the list of vitamin C foods for Type A School Lunches. When this approval was announced in December 1968, it was understood that processors shall adopt and use voluntary, uniform standards to restore vitamin C to the level contained in boiled, baked, or steamed fresh white potatoes--about 20 mg. per 100 grams (about one-half cup) of edible portion.

Can Potatoes Be Marketed Nutritionally?

I have pointed to some needs for nutritional improvement and to the potential role of potatoes in meeting these needs. The opportunity to feature nutrition in marketing potatoes seems consistent with the following statement from the report of Panel III-1 of the White House Conference on Food, Nutrition, and Health.

> We recommend that the problem of malnutrition should be attacked with emphasis on nutritious and traditional foods that people are accustomed to consuming since we have an adequate supply of such foods and the thrust of our efforts should be toward protecting and developing this supply. This should not preclude the fortification and supplementation of traditional foods and the development and introduction of new foods, particularly such new food products as may offer significant nutritional value at low cost. The latter, however, should be presented and should find their place in the market on their merits and not as special food for the poor.

Potatoes are certainly among the most traditional of foods in the United States and have nutritional attributes that justify using nutrition as a theme to market them in the forms currently available. That dehydrated potatoes are now fortified and distributed to low-income families may be interpreted as contrary to the above recommendation, however. But the program is defensible by reason of the particular need for vitamin C in many low-income households and the proportion of vitamin C provided by this fortified product among the whole array of foods in the Commodity Distribution Program.

But apart from this special case of a fortified potato product, the thrust of my argument will be that potatoes can be promoted nutritionally in the forms currently available in the market place, keeping in mind, of course, the relative nutrient content of different processed forms of potatoes. Nevertheless, the findings I have cited from the nationwide survey are based on the composite of all kinds of potatoes used in households, and we have seen that they contributed significantly to at least five of the eight nutrients studied.

Fortification and enrichment of foods may be a solution for increasing the dietary intake of some problem nutrients, such as iron. But nutritionists and other researchers who are working on fortification remind us that indiscriminate fortification of commercial foods should be avoided. Questions remain to be answered on the availability of various forms of nutrients in metabolism, the possibility of excessive nutrient intake, and the stability of fortified products in storage. Also, there is the persistent problem of finding the "ideal" foods to serve as carriers for the nutrients, that is economical foods that are used regularly and in significant amounts by the target population groups.

I think we are a long way from subsisting on foods developed by "nutrification," as discussed by Paul Lachance in an article in the June 1970 issue of Food Technology. He offers the term "nutrification" as meaning "the addition of a proportion of all necessary vitamins and minerals to a fabricated food" so as to make it completely nutritious. Meanwhile, I think most of us enjoy eating the natural foods fabricated by nature. So let us see how potatoes, a leading example of such foods, can be marketed nutritionally.

Using "nutrition" as a marketing tool may be an uphill task. Dr. Jean Mayer, the Harvard nutritionist who was chairman of the White House Conference on Food, Nutrition, and Health, was also cited in the June 1970 issue of Food Technology as observing that advertisers believed they could not sell nutrition. He urged that food advertising should emphasize the nutritional content of packaged food rather than its appearance and taste.

Several years ago the Washington, D.C., Chapter of the American Marketing Association had a workshop on Food Marketing at which I served as chairman of a session on "Can Better Nutrition be Marketed?" Among the ideas that the panelists brought out as requisite to nutrition-based promotion were: (1) Foods must be appealing so as to satisfy specific goals of consumers, (2) the promotional message must be believable, and (3) the message must be simple so as to be understood and remembered.

At this point we might benefit by reviewing some principles of consumer motivation. Dr. M. E. John, a prominent rural sociologist and social psychologist at Penn State University, lists the following as values that serve as motivators to consumer purchases:1/ 1. Functional. 2. Status-giving. 3. Self-esteem. 4. Sentimental. 5. Aesthetic. 6. Economic.

By "functional value" Dr. John was referring to the nutritional value of food, its palatability, and ease of preparation. I have enumerated the special nutritional factors that might be stressed for potatoes. The challenge is to find convincing ways of informing consumers about these nutritional attributes of potatoes, but to do so without exaggeration.

A further challenge is to find the "right" products, that is, forms of potatoes for which to make a nutritional pitch. The trend has been to greater use of processed potatoes (fig. 10). Since 1950 the use of fresh potatoes decreased and consumption of frozen and dehydrated potatoes and potato chips increased. The trend towards greater use of convenience foods is evident everywhere in the food

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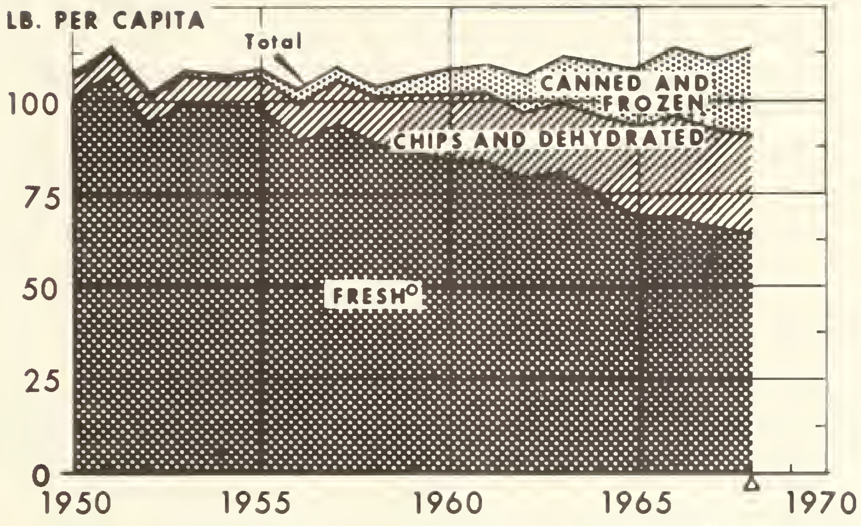
1/ John, M. E., Classification of Values That Serve as Motivators to Consumer Purchases, J. Farm Economics, Nov. 1956.



* FRESH WEIGHT EQUIVALENT. ° INCLUDES SMALL QUANTITIES USED FOR FLOUR. △ PRELIMINARY.

U. S. DEPARTMENT OF AGRICULTURE NEG. ERS 5538-69 (10) ECONOMIC RESEARCH SERVICE

Figure 10.--Potato consumption: Fresh and processed

business. Between the 1955 and 1965 nationwide food consumption surveys, there was an increase of 34 percent in household spending for convenience foods. In fact, farm families led with an increase of 61 percent. The nutritional appeal in marketing processed foods should take account, however, of possible losses in vitamin and mineral content in processing.

A key idea in motivating consumers was stated in another reference to the report of Panel III-1 of the White House Conference: "The attractiveness of foods--their flavor, texture, odor, and appearance--is nutritionally important since foods are nutritious only when they are consumed." When a homemaker tries a new recipe for a very attractive potato casserole, she derives the value of "self-esteem" because she can say "I did it myself!" If she serves this dish to company for dinner, she also enjoys the value of "status." If she rediscovers and tries a potato recipe from grandmother's cookbook she obtains "sentimental" value. The "aesthetic" value is imparted to any potato item or dish prepared from potatoes where attractiveness and garnishing are principal elements. All these values can be utilized as vehicles on which to "piggyback" the nutritional message.

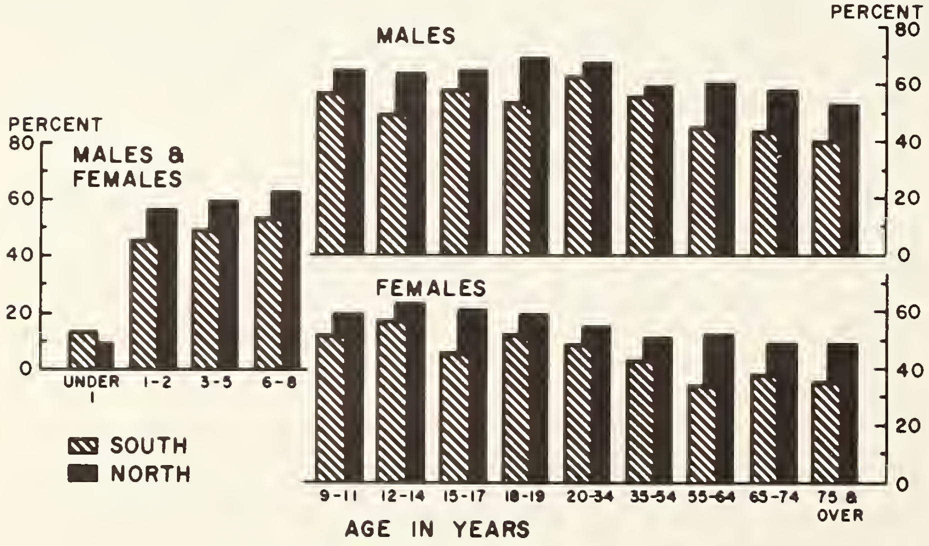
The "economic" value was listed last by Dr. John, but it is not among the least. Earlier I discussed how potatoes are a "good buy" in terms of nutrients obtained per dollar of food spending. We consider potatoes a separate food group in developing the USDA food plans, because they provide flexibility to change the amounts of foods in the low-cost, moderate-cost, and liberal-cost food plans. These food plans set forth suggested amounts of foods for a good diet.

To Whom Should Nutritional Marketing Efforts Be Directed?

The answer in general is: To people who are the lowest users of potatoes and who might benefit most from the additional nutrients obtained if they would eat more potatoes. How do we segment the market to isolate these population groups?

Our survey showed that average vitamin C intake from food was lowest for persons in low-income households, those with incomes under $3,000 in a year. Diets of persons in low-income households in the South fell even further below the RDA for vitamin C.

That potatoes could fill a need for improvement in vitamin C intake in the South is indicated by the fact that persons in practically all sex-age groups were less likely to use white potatoes in the South, and they used generally smaller average amounts, than in the North, which includes the rest of the United States (Fig. 11). The difference in



USDA NATIONWIDE FOOD CONSUMPTION SURVEY, SPRING 1965

Figure 11.--Potatoes - percent of persons using in a day.

percent of persons using was even greater when low-income households in the South were compared with those elsewhere. As one example, for women of ages 35-54 in households with incomes under $3,000, only 31 percent used potatoes in the South, as compared with 52 percent in the rest of the United States.

The household survey showed, also, that low-income families in the South were less likely to use fresh potatoes than elsewhere and a smaller percentage of them used potato chips and sticks.

What Are the Potentials and Limitations?

For potatoes, there is an opportunity to use informative advertising--the kind that could provide some little-known facts about nutrients in potatoes. It should emphasize that nutritional improvement may be obtained from potatoes at reasonable cost.

The promotional task would seemingly be more effective if the marketer used the technique of "pulling" potatoes through the market rather than "pushing" them. Pulling them through means that consumers must be motivated by a convincing marketing message. If they really want more potatoes, for their nutritional merits, they will put them increasingly on their shopping lists. On the other hand, much of the farm product promotional activity in years past has been of the "pushing" variety, as seen in bumper stickers that say "Eat more (this or that)," but without telling the consumers why they should do so. Recently, I saw a news item which said that the Greek government has "ordered all restaurants in the nation to serve potatoes twice a day." Also, it said that an advertising campaign would be launched to persuade Greek housewives to serve potatoes more often. This is the "pushing" type of campaign.

Consumers want information as to how foods can help them nutritionally. To this end, we have prepared a publication entitled "Food For Fitness" which serves as a daily food guide for families. It stresses the need for selecting foods from the four principal food groups--milk, meat, vegetable-fruit, and bread-cereal. It contains helpful information on nutrients provided by each group and suggested servings.

These food groups are receiving new publicity as "The basic four" in a nutritional awareness campaign to be launched by the food industry in September and October. It will be sponsored by the Food Council of America, which is linked with most of the principal food trade associations of the country in a combined effort for this forthcoming campaign. The theme will be "Eat the basic four foods every day." This campaign may serve as an opportunity to launch a coordinated, nutritionally based marketing program for potatoes. Also, I would remind you of an ongoing educational effort by USDA--the Expanded Nutrition Program, sponsored by the Federal Extension Service. It involves nutrition aides who visit homes in low-income areas to impart nutritional information and awareness that will lead to nutritional improvement.

Certain limitations must be considered, also. First, stick to the facts and avoid exaggerated claims in advertising or promotion. Don't imply that certain processed potatoes have the same nutrient levels as fresh potatoes. The White House Conference Panel representing agricultural organizations warned against making recommendations relating to "the nutritive merit or dietary influence of any food or food products that have not been substantiated by authoritative research." They state, also, "we are opposed to mandatory fortification of food." Implied in these comments from their report is the need for assuring consumers that the food industry's advertising claims are honest and believable, that they are based on adequate research and testing in product development, and that the foods are nutritious as claimed, while also being safe and palatable.

I will close with this quote from Dr. John's article which I cited earlier: "The job facing the merchandiser is to eliminate through promotion those conceptions of the commodity that retard consumption and to instill into the thinking of the consumer those ideas that contribute to high consumption." If you heed this advice, a nutritional campaign for potatoes should meet with some success. Years ago ads for a musical instruction course appeared in magazines reading, "They laughed when I sat down to play." I was reminded of that as I thought, hopefully, that skeptics would no longer consider the subject assigned to me today a laughing matter if, indeed, potatoes will be marketed successfully using nutrition as a tool.

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